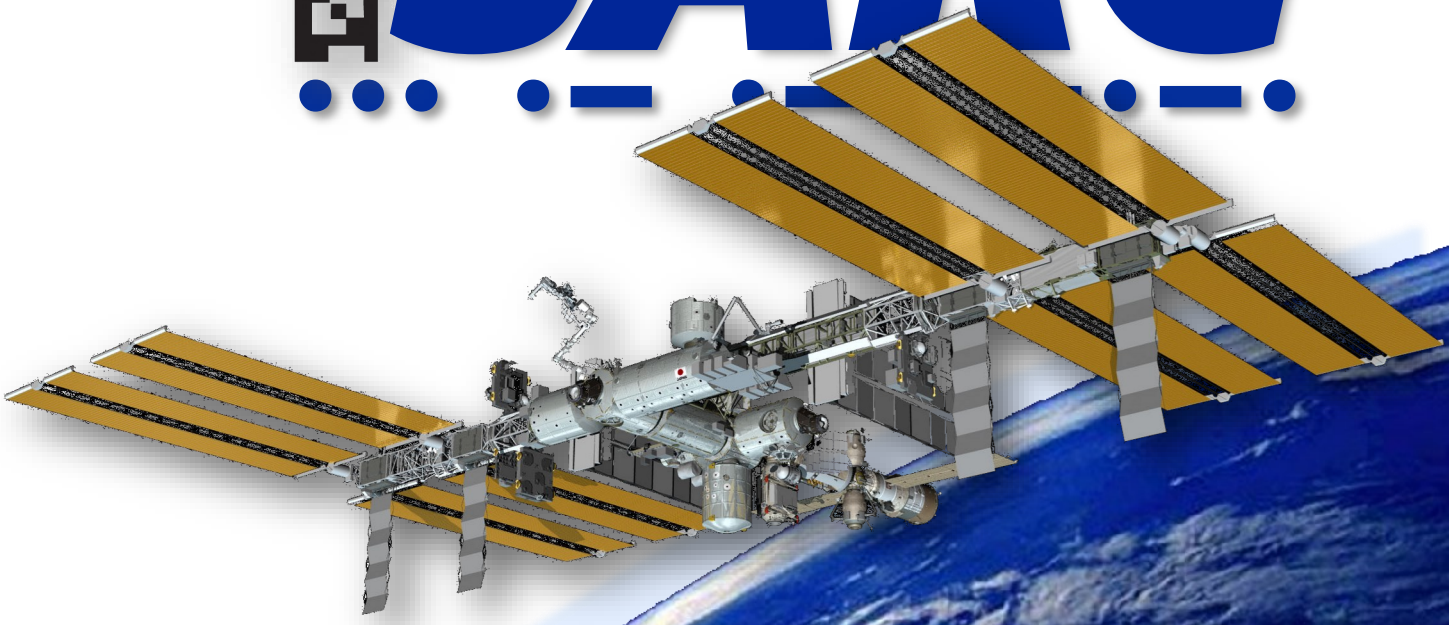
The Communicator

January—February 2021

SARC



- Working the ISS Repeater
- HamShack Hotline
- Raspberry Pi

A Publication Of Surrey Amateur Radio Communications

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The Communicator is a publication of Surrey Amateur Radio Communications.

It appears bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

During non-publication months we encourage you to visit the Digital Communicator at **ve7sar.blogspot.ca**, which includes recent news, past issues of The Communicator, our history, photos, videos and other information.

To subscribe, unsubscribe or change your address for e-mail delivery of this newsletter, notify **communicator @ ve7sar.net**

Regular readers who are not SARC members are invited to contribute a $5 annual donation towards our Field Day fund via PayPal.

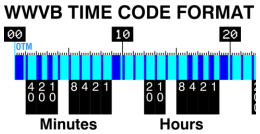
SARC maintains a website at **www.ve7sar.net**

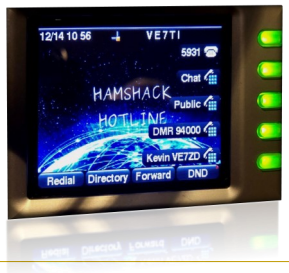
DEPARTMENTS

IN THIS ISSUE

Daniel's Workbench—Has 6 articles this month!

Alternatives to GPS and Network Time Servers





HamShack Hotline

QRM --.- .-. --

...from the Editor's Shack

Do you have a photo or bit of Ham news to share? An Interesting link?

Something to sell or something you are looking for?
eMail it to communicator at ve7sar.net for inclusion in this publication.

Another issue and a thank you to all who contribute to the success of this newsletter. We go into 2021 with a very capable set of writers who have agreed to make their work available to our many readers.

We have one disappointment to report. Southgate Amateur Radio is a ham-based Internet news service from the UK. They publish a daily list of items of interest to our community. For years they published the link to The Communicator but that suddenly stopped with the last issue. As a result there were fewer downloads, which is a disappointment because we know from your feedback that this newsletter is popular and read in over 120 countries and one of our largest fan bases is in the UK. Unfortunately my emails to them were received, but have gone unanswered. I'm not sure what we have done to have them ignore us but, please share our issues with your fellow hams to help us get the word out there and, if you know someone in Antarctica, please tell them about The Communicator. It's the only continent we're missing.

The story on HamShack Hotline (HH) and the presentation at the last SARC meeting has stirred up a flurry of local activity. As of this writing there are now 4 SARC members with HH phones and it's turning into quite the learning experience in programming. I have personally managed to get my iPhone connected via Bluetooth and can now use my HH phone for regular incoming and outgoing phone calls as well. We have a SARC conference bridge at HH#1370 and a FanOut number at HH#811. Much more on this story on page 70.

Enjoy this issue.

~ John VE7TI
Editor

This Month's Issue...

Another issue filled with articles from our contributors. Pictured is the ISS which is now the easiest to work satellite, requiring no special equipment.

Be at war with your vices, at peace with your neighbors,
and let every new year find you a better man. *~Benjamin Franklin*

On the Web

ve7sar.net

Between newsletters, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

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The Rest Of The Story…

Frank Conrad

Ham turned broadcaster

Frank Conrad

Frank Conrad (May 4, 1874 – December 10, 1941) was an electrical engineer, and amateur radio operator best known for radio development, including his work as a pioneer broadcaster. He worked for the Westinghouse Electrical and Manufacturing Company in East Pittsburgh, Pennsylvania for half a century. His experimental radio station provided the inspiration, and he acted in an advisory role, for the establishment of Westinghouse's first broadcasting service, over radio station KDKA.

Conrad was born May 4, 1874 in Pittsburgh, Pennsylvania, the son of Herbert M. Conrad, a railroad mechanic, and Sadie Conrad. His formal education ended with 7th grade, however in 1928 his work would be recognized with an honorary Doctor of Science degree from the University of Pittsburgh. He began employment at the Westinghouse Electrical and Manufacturing Company at age 16, and at 23 began working in Westinghouse's Testing Department, where he and another engineer, H. P. Davis, developed the first circular-type watt-hour meter (known as the 'Round Type'). In 1937, it was estimated that 30 million induction-type watt-hour meters were in use. In 1904, the company appointed him General Engineer, and he was promoted to Assistant Chief Engineer in 1921. Conrad was awarded more than 200 patents internationally throughout his life. He was awarded 177 U.S. patents, and at least 42 in the United Kingdom and at least 9 in Germany.

Conrad first became interested in radio in 1913, the result of a bet with a co-worker over whose watch was more accurate. Conrad won the bet, in part because he secretly replaced his cheap watch's internal components with the mechanism from a more expensive watch. While conducting the time comparisons, Conrad began to doubt the accuracy of time signals provided by a Western Union telegraph service, so he built a simple radio receiver to pick up the official Naval Observatory time signals, broadcast nightly by station NAA in Arlington, Virginia. With this receiver he also overheard transmissions being made by a neighbor, John Coleman, so Conrad built a transmitter in order to communicate with Coleman and other local amateur radio operators.

After moving from Swissvale to Wilkinsburg, Pennsylvania, he installed a radio station on the top floor of a two-story garage adjacent to his home. In the summer of 1916 this station was issued an Experimental license, with the call sign 8XK. At this time the station employed a spark-transmitter, thus could only be used for Morse code transmissions.

In April 1917, due to the entrance of the United States into World War One, all civilian radio stations were ordered silenced, including 8XK. During the war Westinghouse was awarded government contracts related to developing radio technology, and Conrad worked on improvements to radio equipment (SCR-69 transmitter and SCR-70 receiver) for the Army Signal Corps. In addition to Morse code, this development work included radiotelephone transmissions, using the recently developed capabilities of vacuum-tube transmitters. In conjunction with his wartime work Conrad was authorized to operate a radio transmitter from his home, using the call sign 3WE, for communication with a second station located at the Westinghouse plant in East Pittsburgh. He also produced a wind-driven electrical generator, attached to a plane's wing, for powering a radio transmitter.

Effective October 1, 1919, the ban on civilian radio stations was lifted. Although his station would not be formally relicensed until January 21, 1921, Conrad resumed experimenting, again using the 8XK callsign, and now also testing vacuum-tube radiotelephone equipment.

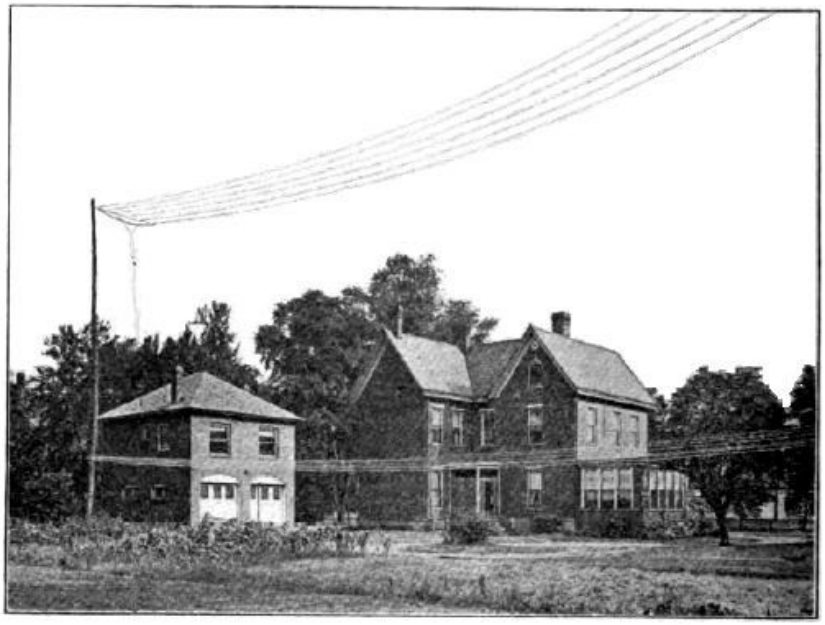
He was responsible for one of the country's first post-war radio broadcasts, when, on the evening of October 17, 1919, he entertained local amateurs with selections from phonograph records. This was the start of a series of test broadcasts, and the novelty of the entertainment proved popular with his audience. Responding to their interest, Conrad adopted a semi-regular schedule, primarily consisting of two hours on Saturday and also Wednesday nights. (The broadcasts weren't universally appreciated, as his wife later reported that he also "used to get phone calls at all hours of the day and night telling him to get off the air".)

Most of these early broadcasts consisted of music, provided from Conrad's record collection. After he exhausted this resource, he struck a deal with the local Brunswick Shop:

...he entertained local amateurs with selections from phonograph records.

The broadcasts weren't universally appreciated, as his wife later reported that he also "used to get phone calls at all hours of the day and night telling him to get off the air".

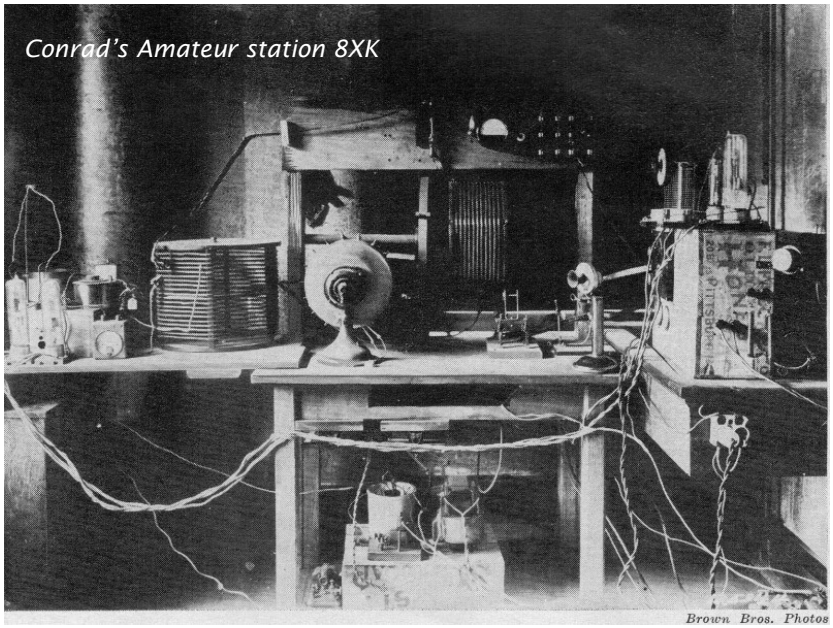
Conrad's home in Pittsburgh showing the "flat-top" antenna with counterpoise used for his experimental radio station 8XK.



in exchange for the store supplying him with recently released records, he would provide on-air acknowledgements. (The son of the Brunswick Shop's owner had been assisting Conrad). Conrad's sons and niece were talented musicians and helped provide the entertainment. He also ran a telephone line from his home's music room to the transmitter in the garage, so performers could use the family piano. On June 26, 1920, a special concert was broadcast for the patients at the Tuberculosis League Hospital.

Conrad also continued to conduct experimental radio work. In the summer of 1920, the American Radio Relay League, in conjunction with the United States Bureau of Standards, conducted a series of tests investigating the phenomenon of radio signal "fading"–the variations in signal strength that affected long-distance signals during nighttime operation. 8XK was one of the key stations participating in these tests.

In late 1920, 8XK's entertainment broadcasts would spark Westinghouse's entry into the broadcasting field. The Joseph Horne department store ran daily full-page advertisements in the Pittsburgh papers, and its September 23 placement noted that the store had started selling simple "wireless receiving stations". Then, in the September 29 installment, the ad mentioned that the Horne staff had recently heard an "air concert" from Conrad's station. Upon seeing this latest ad, Westinghouse vice president H. P. Davis immediately began to spearhead the construction of a Westinghouse broadcasting station. His idea was that the company could start selling its own radio receivers to the general public, with the free daily entertainment offered by a broadcasting station stimulating sales.


Conrad's Amateur station 8XK

Brown Bros. Photos

The American Radio Relay League had already set up a program for various amateur stations to distribute voting results on election day, November 2, and in the Pittsburgh area 8XK had been scheduled to be the local participant. However, Westinghouse decided to inaugurate its new broadcasting service on the same night, so Conrad switched to supporting that effort instead. Westinghouse's election night broadcast was successfully conducted over station 8ZZ (soon to become KDKA) in East Pittsburgh, with Conrad maintaining a watch at his Wilkinsburg garage, ready to have 8XK take over if 8ZZ had experienced problems.

Westinghouse went on to have a leading role in the development of radio broadcasting in the United States. Conrad revised his earlier receiver designs to create consumer products for the company's new customers, and when Westinghouse began selling model RA Tuners and DA Detectors in early 1921, they were advertised as employing "the latest ideas of two noted engineers, Edwin H. Armstrong and Frank Conrad".

Later life

Conrad ended his entertainment broadcasts soon after the establishment of KDKA, although 8XK was one of the primary participants in the February 1921 "Washington's Birthday Relay", in which amateur stations received and retransmitted nationwide a special thirty word message. He also continued doing groundbreaking radio research. While investigating transmitter "harmonics"-unwanted additional radio signals produced at higher frequencies than a station's normal transmission frequency-he unexpectedly found that in some cases the harmonics could be heard farther than the primary signal, something previously thought impossible, as high-frequency radio signals, which had poor groundwave coverage, were thought to have a much more limited transmission range. This led Westinghouse to begin evaluating the commercial potential of shortwave transmissions. In 1924, Conrad demonstrated to RCA's David Sarnoff that low-powered shortwave signals from East Pittsburgh could be readily received in London, using a simple receiver with a curtain rod as an antenna. This matched, at a small fraction of the cost, the performance of the then-current RCA method for transatlantic radio, which used massive longwave Alexanderson alternator transmitters for producing signals that were sent and received using antennas with lengths measured in kilometers.

Conrad's last license for 8XK was deleted on November 3, 1924. The next month Westinghouse arranged to have the callsign of an experimental station in East Pittsburgh changed from 8XAU to 8XK, and the historic call began to be heard worldwide, conducting shortwave transmission tests. In 1928, Conrad demonstrated a movie-film-to-television converter at Westinghouse, and he also did research in narrow-band FM transmissions.

Death and Legacy

Conrad retired from Westinghouse in 1940. He suffered a heart attack on November 6, 1941 while driving to his winter home in Miami, Florida, and died there on December 10, 1941

He received numerous awards for his work, including, from the American Institute of Electrical Engineers, the 1930 Edison Medal "for his contributions to radio broadcasting and short wave radio transmission", and the 1936 Lamme Medal "for pioneering and basic developments in the fields of electric metering and protective services". In 2001, the Wilkinsburg garage that had housed 8XK was carefully dismantled and placed into storage by the National Museum of Broadcasting, with the hope that it can some day be rebuilt to house a broadcasting museum. In the A Return to Normalcy episode of the TV program Boardwalk Empire, employing artistic license, Frank Conrad is portrayed as the person announcing the 1920 election results from Pittsburgh.

...And that is his story.

~

THE PITTSBURGH PRESS,

Obituaries—

FRANK CONRAD, KDKA FOUNDER, DIES IN MIAMI

Former Engineering Chief At Westinghouse Left Here 5 Weeks Ago

Dr. Frank Conrad, founder of Radio Station KDKA and for many years engineering chief of the Westinghouse Electric & Manufacturing Company died at 1:10 a. m. today at Miami, Fla., after a heart attack. He closed his home on the Wil-

DR. FRANK CONRAD
Helped Allies in last war.

liam Penn Highway for the winter five weeks ago.

Dr. Conrad had driven to Florida and became ill just before he reached Miami where he had always hoped to spend his last years in retirement. He was taken to his home and remained gravely ill until he passed away.

Dr. Conrad and Dr. Harry P. Davis who died Sept. 11, 1931, established KDKA after they developed radio communication for the Allies in the first World War.

Mrs. Conrad, a daughter and two sons survive Dr. Conrad.

Helps in World War

The story of Dr. Conrad's connection with radio goes back to 1912, when another Westinghouse engineer bought a watch and promptly challenged the accuracy of watches carried by his associates. Frank Conrad displayed his own watch which happened to be an expensive movement in a cheap case, and lured the challenger into a $3 bet on the relative accuracy of the respective time pieces. A Western Union clock was to be the arbiter.

Dr. Conrad won the bet but his interest in the winning had been lured to other things. So intrigued had he become in the broad problem of time synchronization that he put together a crude receiving set to pick up time signals sent out at regular intervals by the Naval Radio Station at Arlington.

During the World War the government drafted him and he responded by devising, among other important apparatus, the only airplane radio set to see much wartime service

Starts Broadcasts

After the war, Dr. Conrad returned to his garage radio station and announced that he would broadcast (his use of the word in the announcement is the first of record) phonograph records at 7:30 o'clock on Wednesday and Saturday evenings for two hours.

These programs continued through the Spring of 1920 when the now famous ad, announcing that wireless sets could be bought to hear Dr Conrad's programs, gave the idea to Mr. H. P. Davis that regular broadcasting was the means of creating a new and vast field for radio development.

While arrangements for the new station were being completed, Dr Conrad continued his broadcasts from his garage station. Even that night when KDKA took the air for the first time, he was still at home. KDKA engineers, fearful that the new station might fail, asked Dr. Conrad to stand by with his own station ready to carry on with the program in case of trouble at East Pittsburgh.

Tests Short Waves

Continuing with his experiments, even after KDKA had thoroughly awakened latent interest in radio, Dr. Conrad, about 1922, concluded that possibilities were being overlooked in the then unused short-wave bands—bands much lower than those then in use for broadcasting and communication.

Attempting to learn more about the characteristics of short waves, Dr. Conrad arranged to carry on experiments with an amateur station operated by a friend of his in Boston.

Their communications demonstrated that short wave transmissions into Boston were better than regular broadcasting wave signals, and with this beginning the Westinghouse Company arranged for further experimenting on a much broader scale.

New Transmitter Built

A new high-powered transmitter was built in East Pittsburgh. Later, in the fall of 1923, in order to obtain a more central location in the United States for the work, a station was put up at Hastings, Neb. This was operated under the call letters KFKX.

Scheduling a demonstration for radio engineers at a conference in London, England, Dr. Conrad one night asked that Pittsburgh send him what amounted to commercial transmissions. That is, to send extracts from a newspaper by telegraph code.

David Sarnoff played the part of the receiving operator and during the course of an hour or so took down an amount of copy which was almost as large as one full day's traffic of the British Marconi Co.

Was Inventive Genius

Incidental to the success of the demonstration is the fact that a project involving the erection of several million dollars worth of long-wave transmitters at the Long Island plant of the Radio Corp. of America were scrapped. Short-wave transmitters replaced the proposed long-wave system.

Dr. Conrad's fame rest not alone on his radio achievements but also in his inventive genius in electrical fields. He devised the round type watt-hour meters seen in every American home, his pantagraph trolleys power the nation's electric trains, his electric clocks tell the time everywhere. Conrad principles have been applied in auto starting, lighting and ignition apparatus for more than 20 years. In these and related fields he holds more than 200 patents.

Native Pittsburgher

He was born in Pittsburgh in 1874. After finishing the seventh grade at the Starrett Grammar School here, the urge to be working with tools proved more powerful than the desire to complete a formal education. In October, 1890, he joined the Westinghouse Co. At first he was a bench hand in the original Westinghouse plant at Garrison Alley but his natural aptitude for mechanics soon took him to the testing department.

When the head of the laboratories soon after left on a trip to Europe, he told young Conrad to "look after the place." Conrad did—examining everything with an eye to seeing how it might be improved. At 23 he had made his first important contribution—the round type watt-hour meter, now in universal use.

In 1904 Dr. Conrad was appointed general engineer and for many years served as assistant to the vice president in charge of engineering. He has been assistant chief engineer of the company since 1921.

Honored Many Times

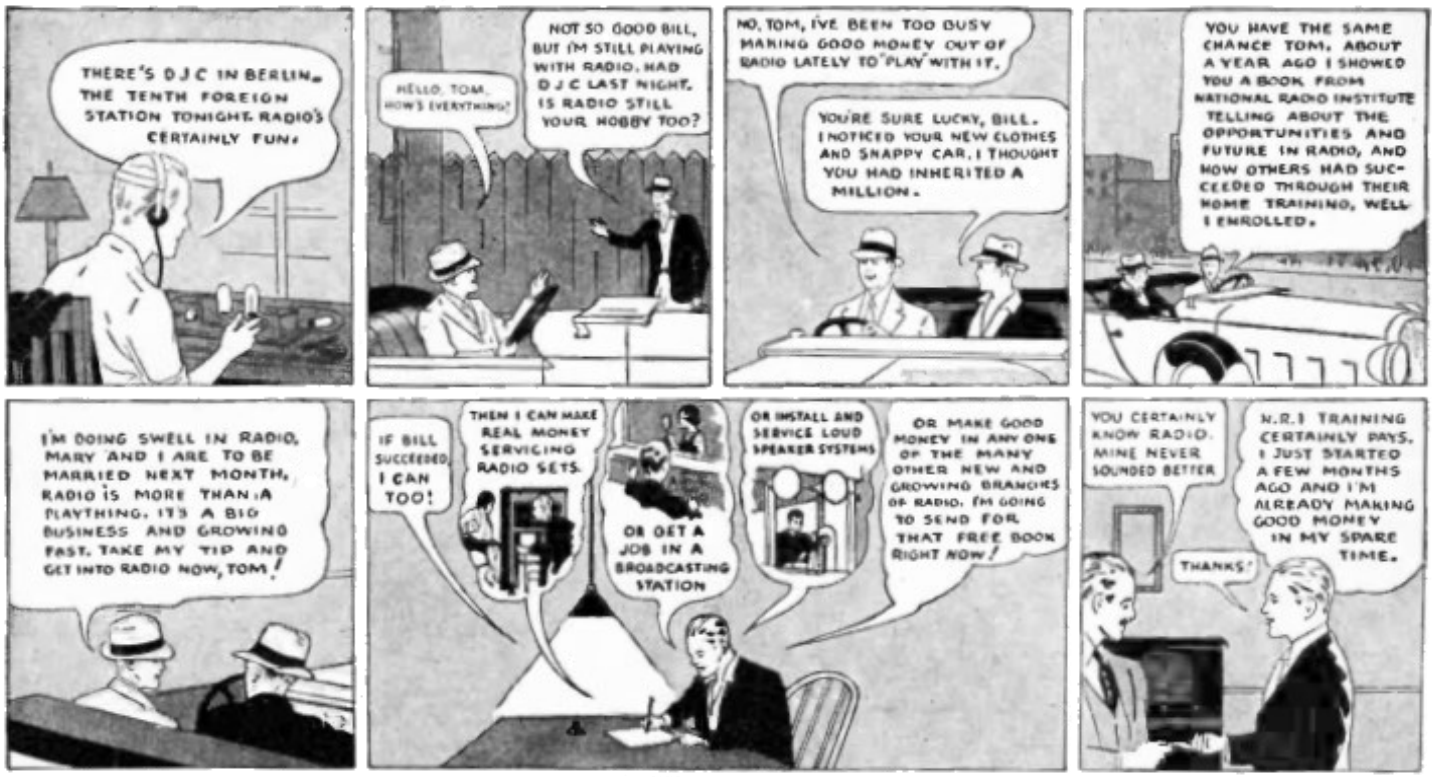
Dr. Conrad received the honorary degree of Doctor of Science from the University of Pittsburgh in 1928. In 1926 he was awarded the Morris Liebman prize by the Institute of Radio Engineers; the Edison Medal of the American Institute of Electrical Engineers in 1931; the John Scott Medal of the City of Philadelphia in 1933; the Lamme Medal of the A. I. E. E. in 1936; and the Gold Medal of the American Institute of the City of New York in 1940.

An authority in the fields of biology, botany and astronomy, Dr. Conrad was a Fellow of the Institute of Radio Engineers and a member of the American Institute of Electrical Egineers, the Society of Automotive Engineers and the American Society for the Advancement of Science.

A look back into the web time machine...

SHORT WAVE & TELEVISION for DECEMBER, 1937 401

How a "Tip" got Tom a Good Job



. . . . I will train you to start a spare time or full time Radio service business Without Capital

Many Radio Experts Make $30, $50, $75 a Week

J. E. Smith, President
National Radio Institute
Established 1914

Emergency Comms

Ham Radio Making A Difference

Matthew L Kaskavitch

Baofeng saves the life of ham radio operator

Ham radio is often portrayed as irrelevant. A dying hobby in the age of the cell phone. Ham radio operators know nothing could be further from the truth. One operator who would be the first to back that up is Alden Summers Jones, KC1JWR, from Vermont.

During the Summer of 2020, Alden decided to take a hike with family on the Long Trail in Vermont. Long Trail is the oldest hiking trail in the United States and crosses the highest peaks in Vermont. Like any smart ham radio operator, Alden made sure to bring his HT on the hike as mountainous regions often lack cell phone coverage.

During the hike, Alden suddenly felt lightheaded, and his heart began racing. Then… nothing. The lights when out as he suffered a seizure from low blood sugar. A local EMT was nearby and rushed to Alden's aid. The EMT pulled out his cell phone but was unable to contact dispatch. There they were, stranded on a mountain with a medical emergency and no cell coverage.

Now what?

K1FFK repeater site atop Mt. Greylock in western Massachusetts.

"As I arrived at the staging point set up by the Fire Department, I met up with Fire Chief Scott Moore (95-C1) of the Wilmington Fire Department, who was Incident Command. I told him how I heard about the incident and offered my services. I then got to work attempting to make contact with Ron over the 91. We were in a bit of a shadow as far as coverage went from the 91, and my first attempt to make contact with my HT was to no avail. I then went to my truck to try my mobile radio, which also failed to open up the repeater. Running out of options, I went into my radio bag and constructed a roll-up J-Pole out of some 450-ohm ladder line, a short length of coax, and male UHF connector. In that bag I keep some basic soldering equipment and a power inverter for the truck. Once it was constructed and tested, I grabbed my fishing pole from the back seat, put a weight on the end, and cast the weight into the highest branch I could find. I tied the J-Pole to the end of the line and reeled it up about 20′ into the tree with the help of a barrel connector and about another 24′ of coax. I tried that antenna plugged into the back of my mobile radio, and we were up and running! I was then in contact with Net Control!"

~ Matthew Sacco, KC1JPU

Ham radio to the rescue

Alden, who regained consciousness, reaches into his bag and pulls out the most hated ham radio known to man — his trusty Baofeng. He put out a call on 146.91 (K1FFK) located at 3,500 ft on Mt. Greylock. The 146.91 repeater is one of the widest coverage mountaintop repeaters on the East Coast.

The emergency call was acknowledged by Ron Wonderlick, AG1W. Another ham named Matthew Sacco (KC1JPU) was monitoring the emergency traffic. After a short discussion with Ron, Matthew went mobile and put himself at the emergency responder staging (parking) area where crews would enter the backcountry wilderness.

With communication established, the next challenge was finding the hiker and choosing the right equipment to get Alden (KC1JWR) off the mountain. Someone on the scene used his cellphone to give Google Maps Plus Code, which first responders converted into a latitude and longitude.

As the rescue team approached Alden's location, they realized getting an ATV to him for evacuation wouldn't be possible. They were going to need a helicopter rescue. The ham radio operators on the K1FFK emergency net passed traffic to notify New York State Search and Rescue. As Alden and others waited hours for search and rescue to arrive, he spent time talking about ham radio.

Another hiker worked to clear an opening for the helicopter to lower its rescue basket. The GPS coordinates are relayed through the ham net to the responding helicopter crew. While the rescuers were talking to the helicopter on their radios, they were having trouble making contact through with their rubber duck antennas. So, Alden, who had a better aftermarket antenna for his HT, lent it to the rescuers for better communication.

Alden was first flown to Woodford Mountain for evaluation and treatment and later airlifted to a hospital in Albany, NY. During the flight, Alden again talked to the pilots and the other rescuers about ham radio the value it can have when you need it most.

Neil Van Dyke (N1TNC), the Search & Rescue Coordinator for the Vermont Dept. of Public Safety, was the one who called in Search and Rescue. When asked about the event, Mr. Van Dyke said, "Ham radio was a key part of the incident and played a major role in the rescue".

What can we learn from Alden's story?

So many believe ham radio is no longer needed. We have smartphones, right? The truth is our communications infrastructure is incredibly fragile. It can collapse with a moments notice. Furthermore, even in 2020 cell signals don't cover everywhere.

I lived in Colorado for nearly a decade. I've lost count how many times I would rely on ham radio in the Rocky Mountain backcountry for voice or data coverage (APRS) when Verizon and AT&T showed "No Service".

Keep that radio on 146.520 simplex, scan your local repeaters and keep one ear on your radio if you live in remote areas. I would keep my four element vertical yagi pointed at Rocky Mountain National Park during the summer months just in case a tourist needed assistance.

If you're going into remote areas yourself bring a radio and some RF gear with you. Consider building a go-bag with some basic ham radio gear if you're an avid outdoorsman.

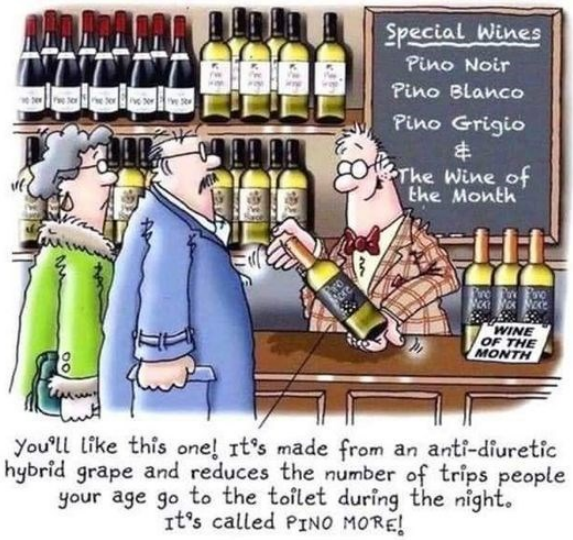
You never know when amateur radio could make the difference. In fact, Alden said it best, "Ham radio saved my life last night."

~ Matt K0LWC

Reprinted with permission

Matthew L. Kaskavitch lives in Maple Grove, Minnesota and started in communications at age 11. He currently works in digital marketing and is on the web at his YouTube Channel, his blog http://k0lwc.com/, and on Instagram @K0LWC.

Alden being rescued off Long Trail by New York Search and Rescue



A Follow-up…

How amateur radio has changed for me

Fred VE7IO followed up on the last issue of the Communicator with these comments…

I was first licensed in 1975 as VE7CJG and operated the first year on CW only as required by regulations. My equipment was a borrowed Hallicrafters SX 115 receiver and a Viking Ranger 50 watt transmitter. These were connected with and antenna relay switch. Antennas consisted of a dipoles for 20 and 80 meters and a homebrewed vertical for 10 meters.

This was my station and as a new Ham I was glowing in the magic of being able to talk to people around the world.

My next upgrade was to build a Heathkit HW-101 transceiver which was a big step forward but still operating CW. In 1976 I wrote for my advanced license, passed and now could operate phone.

So fast forward 45 years and now my station has expanded to focus on contesting and DXing. Two radio positions with legal limit amplifiers and 3 computers networked using N1MM+ logging software. So looking back what changed to allow my station to change both physical and performance wise.

Physically, the addition of computers, solid state radio technology, SDR radios and an abundance of amateur radio software. For me operating my station has gone from logging all my QSO's on paper to computer logging. From physically adjusting my radio to point and click on a computer screen. From fixed direction antennas to antennas that are directional and completely controlled from a computer including antenna switching. My station can now be operated remotely over the WAN a far cry from the Viking Ranger days.

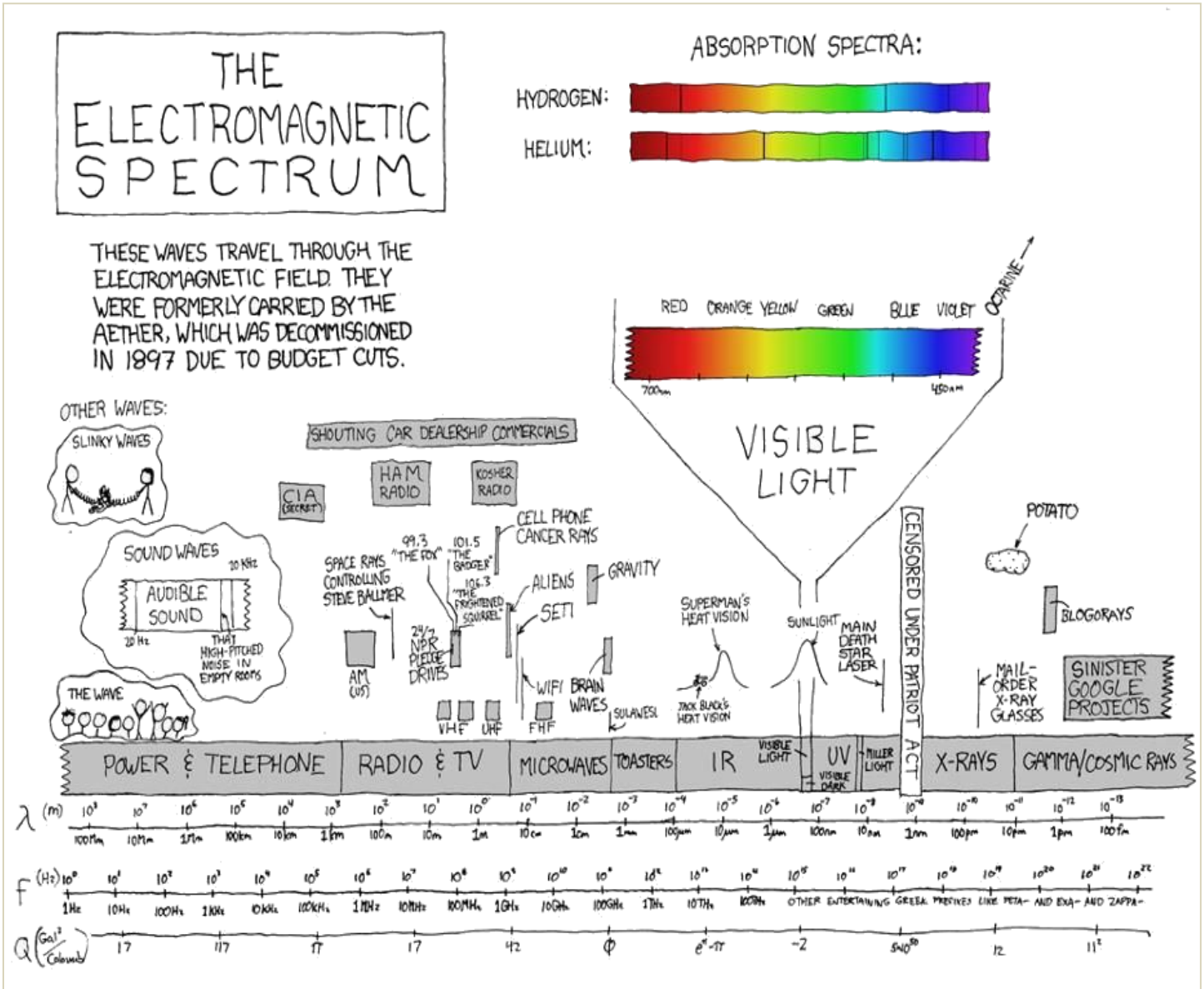
So with these technological changes what difference has it made to how I enjoy my hobby? Back in 1975 I had to turn my receiver and transmitter on well ahead of making my first QSO to allow them to stabilize as frequency drifting was common. Receivers were not anywhere near as sensitive as todays SDR technology. Good thing I was young in those days and my hearing was way better than it is today. Having lost a good part of my hearing I am very thankful for modern receivers. For me the technological advances have allowed me to open my station to guest operators, something I really enjoy. We now have computer software and hardware that allows us to connect stations into a common database when contesting. The operating mode is known as Distributed Multi Operating (DMO). No one would have thought this possible in 1975. I would suggest that the integration of computers in our hobby has been the biggest single change. I have one of our regular contesters now able to access one of my IC-7610 radios remotely over the internet. She operates from her apartment and enjoys DX and Rag chewing. In 1975 I, nor most hams, could not have imagined how computers and advanced radio technology would change how we operate.

Yes for me amateur radio advances, computer integration and improved radio design have widened my use of my radio station. Operators can now operate 2 radios simultaneously, SO2R, because of these advances. Also the radio shack of today uses much less energy to accomplish improved transmit signals.

~ Fred Orsetti VE7IO

Page 13—News You Can Lose

The Lighter Side of Amateur Radio



Radio Ramblings

Kevin McQuiggin VE7ZD/KN7Q

Alternatives to GPS and Network Time Servers

The accuracy of these time signals, considering propagation effects, is usually within about 20 milliseconds

Keeping accurate time is important for all radio amateurs, both for the accuracy of our logs and to ensure synchronization of transmission and reception when we use advanced digital modes such as FT8, MSK144, ISCAT, JT65 and others. Without accurate time settings, successful QSOs using these new modes are very difficult.

This column I'd like to take a look at alternatives to both GPS-based and network-based (NTP) time standards for use in our amateur radio activities. Specifically, we will look at the WWVB service that transmits time signals in the LF range, way down at 60 KHz.

I'll describe the encoding of the time signals, the technology necessary to decode them, and provide links to an affordable receiver and free Arduino-based software that can be used to receive WWVB and decode its time signals throughout most of North America.

Historical Context

Standard time signals have been broadcast by radio since the early part of the 20th century [3][7]. Over time, these signals became more complex and more accurate, and the broadcasts began to include other important information such as severe weather warnings, notice of geomagnetic storms, and other events. Beginning in the 1960s, the time signals themselves evolved to include a digitally encoded time signal as well as the familiar voice announcements heard throughout each minute. It is these digitally encoded signals that we will be examining in this article.

WWV and WWVB

There are several time signal stations in operation around the world [14]. Notable because of their higher power and broad geographical coverage are the services of WWV and WWVB. Both stations (and a sister station in Hawaii, WWVH) are maintained by the USA's

National Institute of Science and Technology (NIST). WWV and WWVB are based in Fort Collins, Colorado, and operate 24/7/365 providing highly accurate carrier frequencies (2.5, 5, 10, 15 and 20 MHz) and time signals that are synchronized with global atomic time standards. See Figure [1].

The accuracy of these time signals, considering propagation effects, is usually within about 20 milliseconds (20 ms). The accuracy of WWVB's time signals, which we will be considering in this article, can be under 0.1 ms but are usually within 15 ms of the actual time. This is easily good enough for setting amateur station clocks or computer clocks for use with digital modes such as FT4 or FT8 [16].

WWVB can be received within North America, and as such can serve as a time standard for amateur radio stations that do not have Internet access (think roaming or portable operations) and which do not have a GPS or GNSS receiver and the associated equipment to synchronize their computers' clocks to satellite signals.

WWV (and WWVH in Hawaii) also broadcast digital time signals, and those may be the subject of a future article. We'll focus on WWVB here, because its signals can be decoded easily using low-cost equipment and free software.

Figure 1 – WWVB in Fort Collins, CO [7]

Signal Coverage of WWVB at 60 KHz

LF propagation can vary considerably throughout the day, and received signal levels also vary depending upon the time of year. This places some limitations on successful reception and decoding of time signals from WWVB at 60 KHz.

British Columbia in particular is on the fringe of WWVB's coverage area. WWVB reception in BC at some times of day and in some seasons can be challenging. Figures 2 and 3 show the typical coverage (red) of WWVB signals at 0600 and 1400 UTC each day [2]. Note that WWVB coverage usually excludes southwestern BC in UTC afternoons (Figure 3).

Currently we are in the winter season, and I have found that WWVB reception is challenging and often not possible, but in the summer reception of the station is fairly consistent in the evenings.

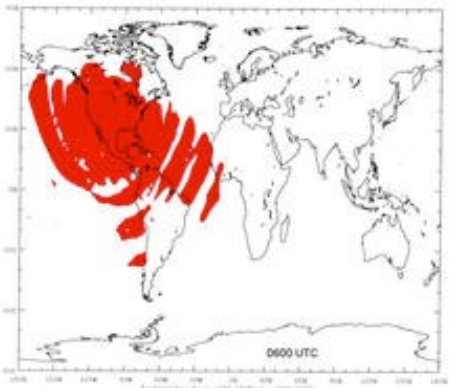


Figure 2 – WWVB Signal Coverage at 0600 UTC

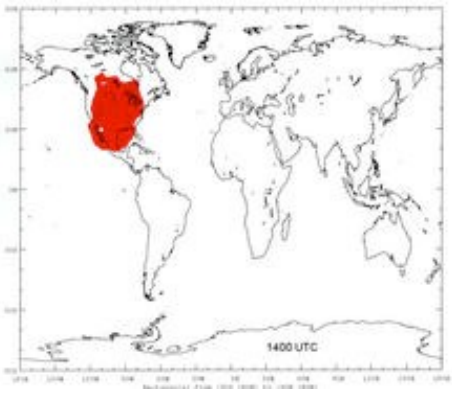


Figure 3 – WWVB Signal Coverage at 1400 UTC

In Canada - CHU

Canada is also in the mix, and our government maintains an accurate, atomic clock-based time signal station (callsign CHU) just outside of Ottawa on HF at 3.33, 7.85 and 14.67 MHz. See Figure 4. Our time signals are in both official languages [9].

CHU operates at a lower power level than WWV and as a result the coverage of the station is poor for the western provinces and in Canada's north. A proposal is underway which would add a second station in the Okanagan to improve reception of signals in these areas. Until then, CHU is usually difficult to receive in the southwest part of our province.

CHU is interesting for today's discussion, however, because it uses a standard form of digital modulation for its time codes which can be decoded by any commercial or home-grade computer modem [9]. The "Bell 103" modem standard has been around for decades and just about any home computer modem (or even the free software package "minimodem" [6]) can decode CHU's digital time signals.

I have a suitable old "US Robotics Sportster" modem that could do the job, but unfortunately I have not had great success with this experiment, as CHU's coverage in western Canada is so poor. I've had several partial decodes, but never a full decode from CHU. If a reader in central North America wants to try this though, she or he would probably have great success.

Figure 4 – CHU, Ottawa, ON

Time Codes

There is lots of interesting documentation available on digital time codes [15]. We're going to focus on how we can decode the digital time code transmitted by WWVB on 60 KHz. So, let's look at the way that WWVB encodes the bits comprising the time code, and how the bits need to be interpreted to figure out what time it is.

The time codes on WWVB are transmitted at a rate of one bit per second. There are 60 bits in a time code message, so each time code takes one minute to be fully transmitted.

Once the 60 bits of the time code have been received, they can be decoded by a little sleight of hand (about 4 lines of programming code) into an accurate date and time value.

This decoded time represents the atomic clock-based time at the START of the minute!

What this means in practice is that at the end of each minute, your program needs to decode the 60 bits to compute the time ONE MINUTE AGO; that is, at the *start* of the transmission of the 60 bits. So, after a successful decode you just *add one minute* to the decoded time: this will be the accurate "current" time. We handle this in the program as well.

The time code is in binary: it is a series of 60 zeros and ones. Each bit is encoded using what is called "pulse width modulation". Let's look at this modulation scheme.

Pulse Width Modulation

Pulse width modulation (PWM) is a very simple way of encoding 0s and 1s onto a carrier signal. You start with a standard "square wave" digital signal (see Figure 5) and then encode a 0 or a 1 by either *shortening* or *lengthening* the width of the normally "square" pulses. NIST chose this encoding method as it is very simple and the 0s and 1s can be recovered quite easily using a cheap electronic circuit. Then the width of each pulse can be used to convert each bit back into a 0 or a 1.

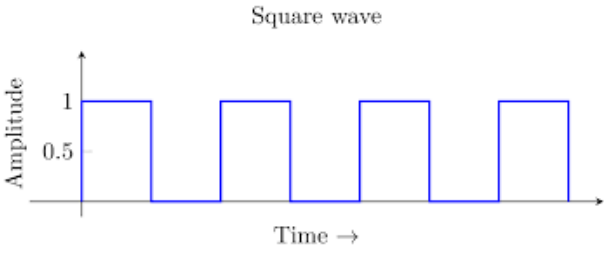


Figure 5 – A Square Wave [10]

Figure 6 *[below]* shows a basic square wave that has had its pulses shortened or lengthened by applying pulse width modulation to it. Note that the carrier wave is still "square", but that the *width* of each pulse has been changed, depending on whether a 0 or a 1 has been applied to that pulse.

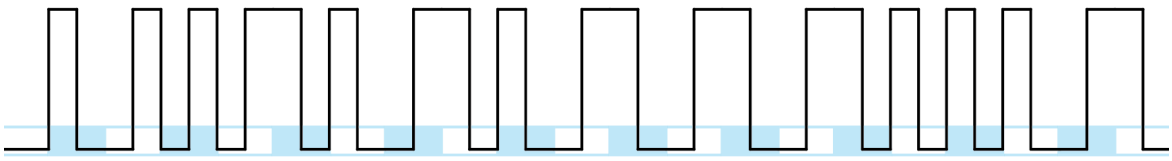
This is why WWVB's modulation method is called "pulse width modulation". Another example of a PWM modulated square wave is shown in Figure 7 *[below]*.

A WWVB receiver operating on 60 KHz can quite easily recover the square wave from the received carrier signal and then output a stream of 0s and 1s. When the received square wave is "high", the receiver outputs a one. When the received square wave is low, the receiver outputs a zero.

Looking at Figure 6, the time scale is indicated by the blue ticks along the bottom of the diagram. The underlying bitstream that might have generated this PWM waveform could be

"0,0,1,0,0,1,0,1,0,1,1,0,1,0,0,1,1,0,1,0,0,1, 1,0,0,1,1,0,0,1,1,0,1,0,1,0,1,0,0,1,1,0".

Figure 6 –Bit Stream of 0s and 1s Applied to a Square Wave Via PWM



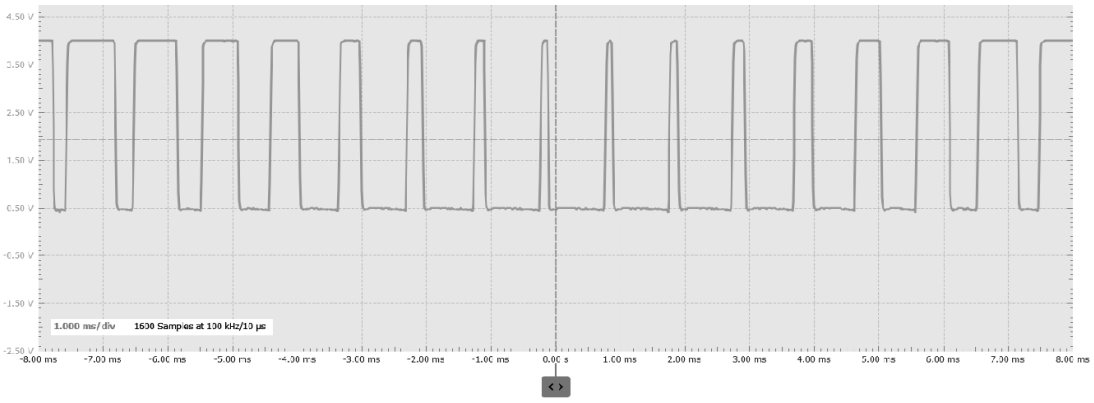


Figure 7 – Second Example: Pulse Width Modulation [8]

A low pulse is decoded as a zero; a high pulse as a one [12]. Try to see if you can see this pattern. Figure 8 shows the bitstream overlaid on the original diagram. Note that the "high" pulses have two distinct widths: a *narrow* width which will be converted to 0, and a *wider* width which will convert to a 1.

Note that this stream of 0s and 1s does not "decode" the pulse widths to recover the time code. We have to reverse the PWM first by timing the length of each positive pulse and reduce this stream of pulse widths to a string of 0s and 1s.

The next step of the process is to measure the width of each positive pulse in the square wave. It is the width of each of the high pulses that determines whether it is a zero or a one. Narrower pulses are zeros; wider pulses are 1s. An Arduino microcontroller will do the work of measuring the width of each pulse.

The physical WWVB receiver we are describing in this article does simply what we have described: it listens on 60 KHz, recovers the PWM square wave, evaluates the pulses and outputs a series of 0s and 1s on a single output line which we will be passed to an Arduino microcontroller. The Arduino code will measure the width of the positive pulses to determine whether each positive pulse is a 0 or a 1. Once 60 bits have been recovered through these measurements, the time can be decoded and displayed for the user.

Bit Recovery

Let's see where we are up to this point. The PWM receiver is listening to WWVB, and it is generating 0s and 1s to indicate whether the data stream encoded on the carrier is low or high. This bit stream is going into a microcontroller that is able to look at these bits.

The microcontroller (our Arduino) has to measure the width of each positive pulse to figure out whether it is a zero or a one. It times the positive pulses and is able to use this timing information to figure out whether each received pulse is either a zero or a one.

In fact, the WWVB time code also contains some "synchronization" and "frame" markers. These are longer pulses than those used for zero and one that will help identify the start and end of each minute. NIST included these extra-long pulses to ensure that decoders can tell when the start of each minute is.

The WWVB standard defines the pulse widths as follows:

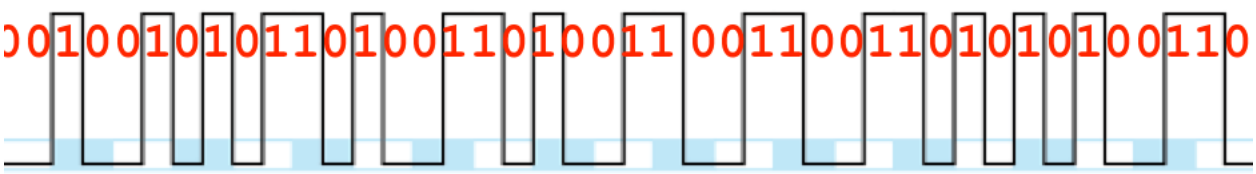
200 ms represents a 0

500 ms represents a 1

800 ms represents the above-described "frame marker"

This timing information can be used to reduce the received bitstream to a time code string of 60 bits for each minute. Our Arduino code does this in software.

Figure 8 – Bitstream Overlaid on Figure 4



The WWVB Time Code

Once the start of a minute has been identified (by the extra-long "frame marker" pulse), the next 60 bits will contain the time at the start of the minute.

The WWVB time code encodes the current date and time in the following order (see Figure 9):

Minutes;

Hours;

Day of the year;

A UTC time correction factor;

A two-digit year; and finally

Some bits to denote leap years and whether daylight savings time is in effect.

The encoding for minutes, hours, day of year and 2-digit year is called Binary Coded Decimal (BCD), a standard format for encoding numeric data which each decimal digit is represented in binary. Minutes, for example, is represented in the time code by 7 bits. In real world decimal format, a 'minute' value can range from 00 to 59. This corresponds to binary values from 000 0000 (decimal "00") to 101 1001 (decimal "59") [13].

In this fashion the BCD bits can each be processed to produce a valid time code. This represents the time at the *start* of the last minute, so the code needs to add one minute to this value to get the actual time.

A Simple PWM Receiver

PWM receivers are cheap. I purchased a "Canaduino" 60 KHz WWVB receiver on eBay [4] for C$18. The receiver measures approximately 2 x 3 cm and is shown in Figure 10. These receivers are made in Canada and have a good reputation for quality and functionality. The receiver comes with a ferrite loop antenna optimized for 60 KHz and a crystal. Directions are provided as is online technical support. The only assembly required is to solder the crystal onto the board, and to solder the loop antenna onto the "ANT" pins. I also soldered an 8-pin header onto the board as well that brings power (3-15V) in, and provides control signals and data.

The "OUT" pin on the receiver board carries the PWM signal state (0 or 1 as per Figure 8 above) to an input pin of my Arduino board where it is sampled and timed by software, as described below.

The Arduino Solution

I originally developed code for decoding the time signals from WWVB in about 2010, and ported it to the Arduino in 2012.

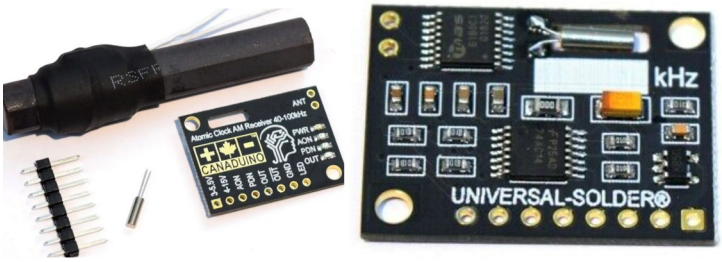
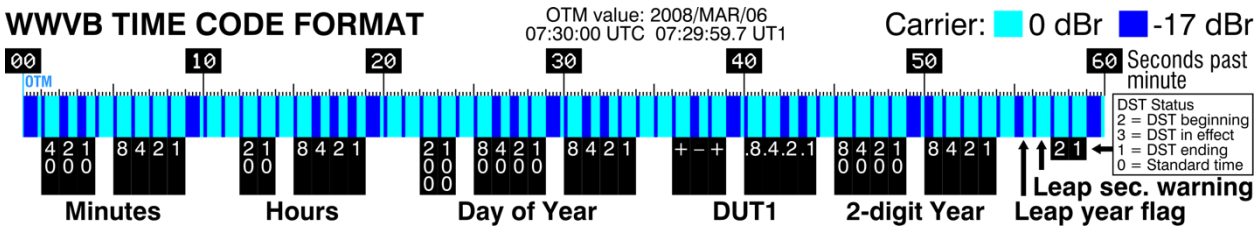


Figure 10 – "Canaduino" WWVB Receiver [4]

Figure 9 – WWVB Time Code [1] and [3]



In preparation for this article, I re-evaluated the code to make sure that it will still run on newer Arduino boards. To connect the PWM receiver, you just route the PWM receiver's data OUT pin to input pin 22 of your Arduino board.

Just about any type of Arduino should work, so I suggest going with a basic model such as the "UNO" at US$23 [17]. See Figure 11.

Figure 11 – Arduino Uno [17]

My WWVB decoder program for the Arduino is available at:

https://www.dropbox.com/sh/ltoxwp38rsot0wp/AADUH_z9sZTyVKWFIsxUC9Fma?dl=0.
Download and use it, or modify it as you wish. Please keep me in the loop with any improvements you make!

The WWVB decoder program requires only a very small amount of flash memory. Your Arduino will require a serial port, however, and uses it to report progress and decoded time in ASCII (basic text) format. In a more complex application (you may wish to modify the program to do this!), the serial port could be reconfigured to talk to a computer via USB and report the time in a manner suitable for setting the machine's clock. Thus, the computer's time could be synchronized accurately with global atomic time to support QSOs using modern digital modes such as FT8 or similar.

The screenshot in Figure 12 shows how the numbers recovered from the message bits can be combined to produce a valid time value. An arithmetic statement just "juggles" the digits around to produce a coherent time string…

Figure 12 – A Bit of Arithmetic Converts PWM to UTC

Summary

I learned a lot from developing this WWVB receiver. I hadn't worked with PWM before, other than having read about it in a data communications textbook. When you decide to actually *implement* something you have just read about, you learn a lot more about the subject as you navigate all the details, solve problems and get the concept running in the real world. This project was like that!

I found this project lots of fun and can still remember the excitement of seeing the first WWVB packets being successfully decoded. It seemed like a bit of magic. Like in any other field, one can learn a lot from digging into a subject and doing enough research to develop a solution on your own. It is also much more satisfying than simply buying a solution and hooking it up.

This is a great project for the winter months. If you decide to start on this project now, you could do your background reading and research, gather the parts, put everything together and have your receiver and Arduino ready to go when 60 KHz propagation improves in the spring. I'll be around to help if you have questions!

Comments are always welcome. Feedback on this article can be directed to the Editor, or directly to me at mcquiggi@sfu.ca.

73 and all the best for 2021 to everyone.

~ Kevin VE7ZD / KN7Q

Article references:

[1] WWVB time code diagram from https://en.wikipedia.org/wiki/WWVB.

[2] Propagation maps from https://www.nist.gov/pml/time-and-frequency-division/radio-stations/wwvb/help-wwvb-radio-controlled-clocks.

[3] "NIST Time and Frequency Services", by Michael A. Lombardi. See https://tf.nist.gov/general/pdf/1383.pdf.

[4] Available for C$18 on eBay: https://www.ebay.ca/itm/CANADUINO-60kHz-Atomic-Clock-AM-Receiver-Module-for-WWVB.

[5] Code for my WWVB decoder is available at https://www.dropbox.com/sh/ltoxwp38rsot0wp/AADUH_z9sZTyVKWFIsxUC9Fma?dl=0.

[6] See "minimodem - general-purpose software audio FSK modem" by Kamal Mostafa. Package runs on UNIX/Linux and is available at http://www.whence.com/minimodem/.

[7] See https://www.nist.gov/time-distribution/radio-station-wwvb.

[8] See https://wiki.analog.com/university/courses/electronics/electronics-lab-pulse-width-modulation.

[9] See https://en.wikipedia.org/wiki/CHU_(radio_station) and https://www.radioworld.com/global/chu-canadas-time-station.

[10] CHU leverages the Bell 103 standard and employs 300 bps Audio Frequency Shift Keying (AFSK) at 300 bits per second (bps) with 2025 Hz (0) and 2225 Hz (1) tones.

[11] From https://mathematica.stackexchange.com/questions/100461/how-can-i-visualize-a-frequency-as-square-wave.

[12] In actuality, Figure 4 uses a slightly more complex form of modulation, but the interpretation I give to the pulse widths in the article is accurate enough for an introductory article!

[13] Binary '101' is 1+4 or 5 decimal; '1001' is 1+8 or 9 decimal. Together 101 1001 means "59".

[14] See article by M. Lombardi at https://www.researchgate.net/publication/269427973_Time_Signal_Stations.

[15] See https://www.nist.gov/pml/time-and-frequency-division/radio-stations/wwv/wwv-and-wwvh-digital-time-code-and-broadcast.

[16] Accuracy of computer time for successful use of WSJT-X is described at https://physics.princeton.edu/pulsar/k1jt/wsjtx.html.

[17] See https://store.arduino.cc/usa/arduino-uno-rev3.

The US history of the Nixie tube

Jens Boos

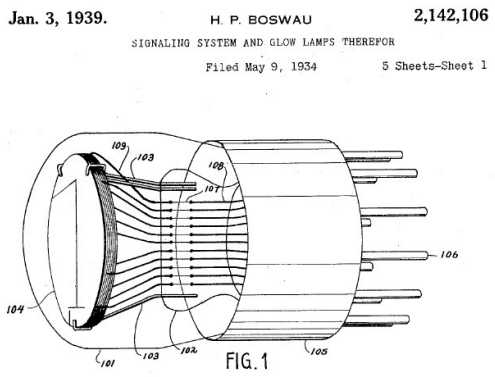
Introduction

A historic device like the Nixie tube that has dominated a whole branch of the electronics industry sure must have an interesting history. This is what I thought when I first got into the field of Nixie tube collecting. As it turned out, it is far more difficult to find information on the Nixie tubes' origins than you would actually assume.

Although there is a lot of information available on the net, the problem with these articles is that most are either too superficial, or speculative without any prove.

This is why I started to write this article. With the help of many sources and contributors a plausible, historically proven historical timeline of the Nixie tubes' origin could be pieced together. It should be noted, though, that as of now the article strongly focuses on the American side of the story, where - according to my current knowledge - the Nixie tube originated. Further research still has to be done to cover the history in Europe. Nevertheless, enjoy what is here so far!

The patent can be downloaded here: US2142106.pdf


Jan. 3, 1939. H. P. BOSWAU 2,142,106
SIGNALING SYSTEM AND GLOW LAMPS THEREFOR
Filed May 9, 1934 5 Sheets-Sheet 1
FIG. 1

The idea of an indicator tube

The effect of the glow discharge that is most commonly used with glow lamps has been well known since the mid of the 19th century. So-called Geissler tubes already used glass bulbs filled with noble gases under low pressure for creating various light patterns [1].

It is no wonder that from 1920 to 1940 there were numerous patents in the area of glow discharge tubes. However, the difficult part is to to determine the first true indicator tube, that was able to display information, i.e. transform an incoming signal into readable information.

It is international understanding amongst the Nixie tube collectors that the US patent 2142106, filed on May 9, 1934, issued Jan 3, 1939, from Hans Paul Boswau fully describes the first actual indicator tube known worldwide *[figure left]*.

There might be other patents from other countries from earlier times, but this is the historically first evidence of an indicator tube known until today. Other countries' patents databases are not as easy to search as the US patent database, this is why it is only safe to say that patent US2142106 is most likely the first American indicator tube patent.

The early date of 1934 is quite striking, since we have no information about indicator tubes being produced at this time. According to H. P. Boswau's daughter, Boswau himself was a tinkerer by all means and would often work late in his basement lab. It is likely that his glow tube - as he called his invention - never made it out of there. [2]

Northrop Aircraft Inc.

After 1934 not too many readout tubes in our sense appeared.

The first US patents that resemble a readout tube were filed in 1950 by assignors to Northrop Aircraft Inc., namely US2618697, US2618760, US2632128, US2723365, US2735038, US2769939. The first patent was filed June 12, 1950, and the first patents were issued November 18, 1952. The last patent was issued in November 6, 1956.

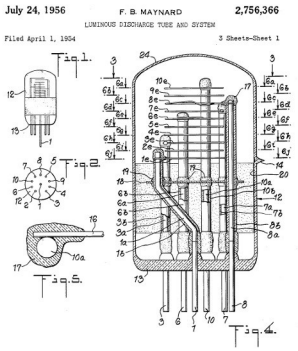
On the right of this page are some pictures.

Northrop Aircraft Inc. was a company that had been founded 1939 [3] and was focused on the production of aircraft for US military. These patents are the only ones ever assigned to Northrop Aircraft Inc., and there is no historic evidence that Northrop has ever manufactured these indicator tubes under their roof.

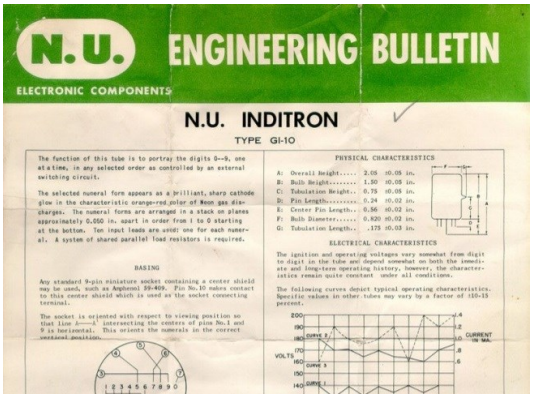
Also, the relatively short time span of two years between the filing and the issuing of the patents above suggests that there was not much competition around at that time these patents could have conflicted with.

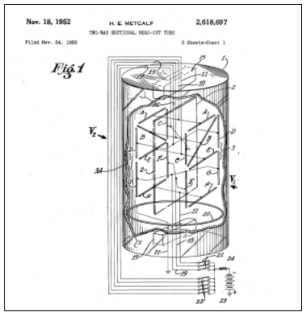
National Union's Inditrons

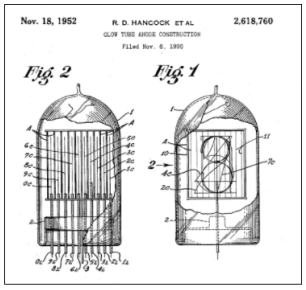
In the early fifties National Union, a company formed by the merger of Magnatron, Marathon, Sonatron and Televocal in 1929 [4], appeared in the field. April 1, 1954, assignors to National Union filed patent US2756366:

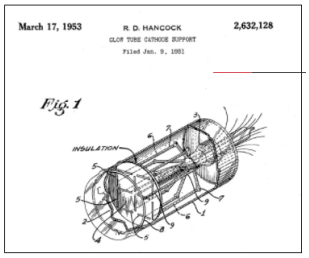

July 24, 1956 F. B. MAYNARD 2,756,366
LUMINOUS DISCHARGE TUBE AND SYSTEM
Filed April 1, 1954 3 Sheets-Sheet 1

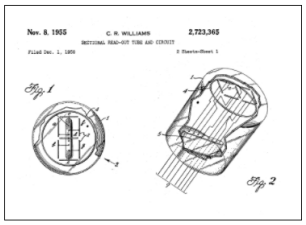
Only one month later, National Union released the datasheet for their GI-10 Inditron tube. The official GI-10 datasheet, dated May 1954 *[click on the image for a larger version]*.

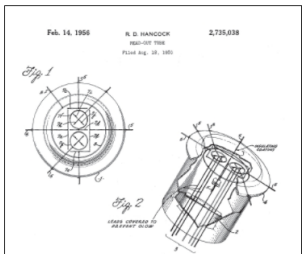

N.U. ENGINEERING BULLETIN
ELECTRONIC COMPONENTS
N.U. INDITRON
TYPE GI-10

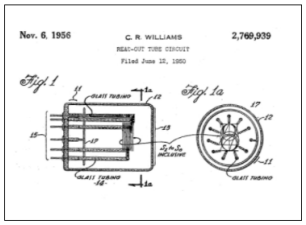

Nov. 18, 1952 H. E. METCALF 2,618,697
Fig. 1


Nov. 18, 1952 R. D. HANCOCK ET AL 2,618,760
GLOW TUBE ANODE CONSTRUCTION
Fig. 2 Fig. 1


March 17, 1953 R. D. HANCOCK 2,632,128
GLOW TUBE CATHODE SUPPORT
Fig. 1


Nov. 8, 1955 C. R. WILLIAMS 2,723,365
Fig. 1 Fig. 2

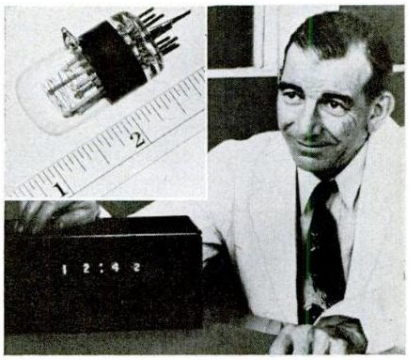

Feb. 14, 1956 R. D. HANCOCK 2,735,038
Fig. 1 Fig. 2


Nov. 6, 1956 C. R. WILLIAMS 2,769,939
Fig. 1 Fig. 1a

Right: Northrop Aircraft US Patents

A higher resolution image can be downloaded here: data_GI-10.jpg (192 KB).

Below: GI-10 article in Popular Science, September 1954; and a Inditron undated promo sheet. Click on images for a larger version.



Flashing Tubes Tell Time

NUMBERS form and change in split seconds on the filament of a new glow tube called an Inditron. The tubes can show the time on dialless clocks (above), flash wins on scoreboards or show data fed to tabulating machines. National Union Radio makes them.

SEPTEMBER 1954 143

The similarity between the tube depicted in the patent and the GI-10 are striking. Other sources confirm that the GI-10 has been released as early as 1954, here is an extract from the magazine Popular Electronics, dated September 1954 *[left]*.

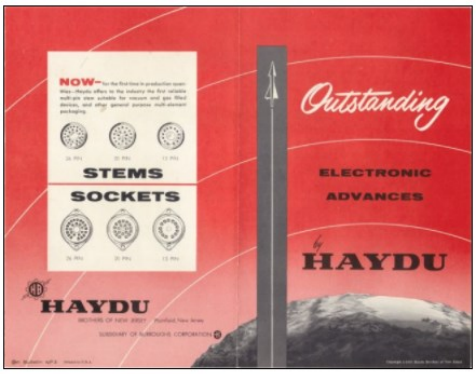
As it turns out, the GI-10 and GI-21 are not the only tubes from National Union's Inditron series, as an undated promotion sheet reveals *[lower left]*.

Although undated, it is assumed that this promotional sheet cannot have been issued earlier than May 1954, because for providing complete technical data on the Inditrons upon request the datasheets already had to exist at the time the promotional sheet was issued. And we know that the GI-10 datasheet is from May 1954. To be fair, the GI-10 as we know it today is not depicted on the sheet, so the dating of 1954 of this promotional sheet is an assumption.

Based on that assumption, the headline stating four years of research and development, and two years of pilot production implies that National Union might have been planning these tubes from 1954 minus 4 to 6 years, that is 1950 to 1948. Interestingly, this is the time period in which Northrop Aircraft Inc. filed some of their patents. Maybe - this is conjecture - Northrop's ideas and concepts were sold to National Union.

Burroughs Corporation and Haydu Brothers

National Union's Inditrons were not the only readout tubes around at that time. Haydu Brothers, a manufacturer of electron tubes had been bought by Burroughs in 1954 [5], and 1955 the first Nixie tube advertisements depicting the HB-106 appeared *[below]*.



These two pages come from a Haydu bulletin that has 1955 printed on the bottom of the page. Another advertisement is seen in the image *[lower right]*.

It is a common misconception that Haydu Brothers developed the Nixie tube themselves. There is no historical evidence for that, although several websites propagate this theory. The advertisements above are ambiguous. The tubes are labelled HB, most likely after Haydu Brothers, but on every ad it says Haydu Brothers - a subsidiary of Burroughs corporation, indicating that Haydu Brothers had already been bought by Burroughs and was thus not marketing an own product line.

After digging a little deeper, I have found that apparently Burroughs purchased Haydu Brothers in 1954

> *...to produce special purpose electronic tubes for data display which have resulted from research at the Paoli laboratory. [7]*

The point is that Burroughs apparently planned the Nixie tube at their Paoli research center [8] and bought Haydu Brothers solely for manufacturing purposes. This theory is hardened by another source:

> *Burroughs purchased the Haydu plant in 1954 expressly for the purpose of manufacturing and selling new products developed at our Paoli, Pennsylvania facility. One of the first new products, the NIXIE tube, started the division on the road to success. [9]*

(Ed. Lord, Editor, the Burroughs Readout, Volume 1, Number 5, July 1972)

Additionally, former Burroughs employee Roger Wolfe confirms this theory. He worked for Burroughs at the Haydu Brothers location since 1954, shortly after the acquisition. He remembers that

> *...the original incentive to purchase Haydu was to obtain a manufacturing facility for the Beam Switching Tubes (also called a trochotron) that were under development at the Burroughs Research Center in Paoli, PA.*

Another logical element underlines this theory: The first electron tube made by Burroughs was the Beam Switching Tube, as confirmed by Roger Wolfe. However, these tubes lacked the possibility to indicate their state. It is only logical that Burroughs then set down to create such a display element.

With all that stated by independent sources, it becomes very clear that Haydu Brothers had no involvement in the development of a Nixie tube prior to the acquisition by Burroughs.

But who was first? National Union or Burroughs?

The extensive patent material shows that National Union beat Burroughs by the nose. What it does not show, though, is the story of Saul

This advertisement is dated December, 1955 [6].

Click on the image for a larger version.

Kuchinsky, who played an important role in the Nixie tube's history: Being a former National Union employee [10] he worked at the Burroughs Research Center in 1954, allowing him to contribute knowledge gained at National Union while trying to build the first readout tubes there.

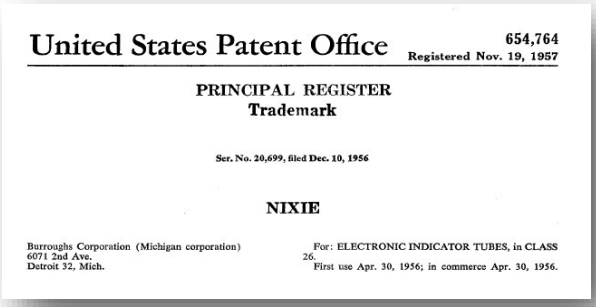
> *Yes, Saul Kuchinsky was a former employee of National Union. I don't recall much about his employment there, but they and others were experimenting with various gas display and counting tubes at that time so it is reasonable to think that some of his thinking originated with his experiences there. (Roger Wolfe)*

Although this information is not dated it is a key point because it provides a logical framework for the theory that National Union was in fact first.

Further along the road...

The next step Burroughs took was filing a trademark request for Nixie in December 1956 [11]:

Nixie tube trademark application



United States Patent Office 654,764 Registered Nov. 19, 1957

PRINCIPAL REGISTER
Trademark

Ser. No. 20,699, filed Dec. 10, 1956

NIXIE

Burroughs Corporation (Michigan corporation) 6071 2nd Ave. Detroit 32, Mich.

For: ELECTRONIC INDICATOR TUBES, in CLASS 26.
First use Apr. 30, 1956; in commerce Apr. 30, 1956.

It was about this time that Burroughs abandoned the HB prefix indicating the Haydu Brothers involvement in the manufacturing process:

> *Later on, I believe it was in 1956, Burroughs changed the operation to a Division called the Electronic Tube Division and dropped the Haydu name. (Roger Wolfe)*

On Dec 13, 1955, the first Burroughs patent (US2874320) for a readout tube was filed, and then issued on Feb 17, 1959. This large time span of more than three years may be due to the start of a readout tube industry at the time.

The rise of a new industry

After that, the rise of a new industry began, and the Nixie tube became an integral part of electronic devices. How exactly that happened remains to be seen.

Although the above gives a fairly good overview over the events in America, the following questions are not yet answered:

- Great Britain: role of the companies Cintel, Ericsson
- independent(?) development in the Soviet union, China, and India?
- worldwide: which companies were Burroughs licensees?

If you can help, please contact me. Any input is greatly appreciated!

http://www.jb-electronics.de/html/allgemein/kontakt.htm?lang=en

~ *Jens*

We thank Jens for permitting us to reprint his article. He has a terrific website at www.jb-electronics.de - Electronics and Programming - www.jb-electronics.de (jb-electronics.de) where he has more information and photos of his extensive collection of Nixie tubes.

There are still Nixie kits available on-line to build clocks and other nostalgic projects.—Ed.

Article references:

[1] http://www.jogis-roehrenbude.de/Roehren-Geschichtliches/Glimmroehren/Geissler-Roehren.htm

[2] http://groups.yahoo.com/group/NEONIXIE-L/message/43022

[3] http://en.wikipedia.org/wiki/Northrop_Corporation

[4] http://www.decodesystems.com/nixie-history.html

[5] http://www.warrennj.org/wths/haydu.htm

[6] http://www.radiomuseum.org/forum/vm_tubes_magnetrons_and_similar_devices.html

[7] http://www.home.ix.netcom.com/~hancockm/history_timeline.htm

[8] www.cbi.umn.edu/inv/burros/paoli.htm

[9] Ed. Lord, Editor, the Burroughs Readout, Volume 1, Number 5, July 1972; cited from http://groups.yahoo.com/group/NEONIXIE-L/message/16667

[10] Roger Wolfe via private email communication; https://groups.google.com/d/msg/neonixie-l/HZ0vGN5Uc38/gMuisvaJM4MJ

[11] http://tess2.uspto.gov/, Trademark Electronic Search System (TESS) from the US Patent and Trademark Office

2nd Generation Foxhunt Receivers Now Available

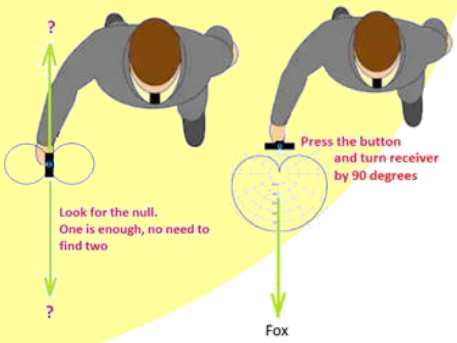
Order now for the Spring foxhunt season, second generation foxhunt receivers by Les Tocko VA7OM and Dave Miller VE7HR are now complete, with the production run tested, tuned up and available for sale.

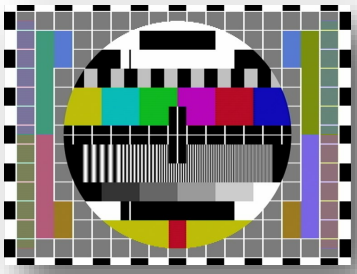
My involvement has been in the administration and final assembly but otherwise all the credit for this technical achievement goes to Les and Dave. Having seen every unit up close, I can assure you that RX80M, as it is called, is of an exceptional professional quality. Full details on the cost, specifications, instructional video and ordering information can be found at www.RX80M.com.

Only 100 of these units are available. Although priority is being given to local orders, it will be "first come, first served" so if you want one, don't delay ordering.

80m transmitters (foxes) will be available soon.

~ *John VA7XB*





USB TV Tuners

RTL-SDR dongles now work on Windows 10 for ATV

Jim Andrews KH6HTV

...the failure is Windows 10's habit of automatically searching the internet for drivers and loading an old, obsolete driver.

Thanks to Gary, K7HYB, of the West Washington ATV Society, in Seattle, WA, he has now solved the problem of how to make the USB TV Tuner dongles work with Windows 10.

The dongles we are referring to use the RTL2832U & R820T2 chips. The internet is overflowing with complaints from many disgruntled users of these dongles that used to work with Windows XP & Windows 7, but will now not work with Windows 10. The major reason for the failure is Windows 10's habit of automatically searching the internet for drivers and loading an old, obsolete driver from 2009. What Gary found was the required driver is called REALTEK 2832U Device Version 64.1.521.2012 dated 21 May 2012. He found it on a German web site www.ukwtv.de. Go to this part of the site:

https://www.ukwtv.de/cms/downloads-aside/281-dab-player-von-andreas-gsinn.html

Scroll down to find Treiber2.zip and down-load it. It contains the correct driver.

With further searching on the internet I then found a good set of instructions on how to install the correct driver, plus tell Windows 10 to use it and not automatically keep reloading the wrong driver. *[Note that this trick works for other troublesome Windows 10 drivers that keep updating themselves as well. -Ed.]*
I am rewriting some of it below as I found useful.

Re-installing correct Realtek drivers on Win10 for RTL-2832U/R820T2 Dongle…

1. First, download the driver (i.e. Treiber2.zip and unzip it)

2. Connect your USB TV Tuner dongle to a USB port on your computer.

3. Then disconnect your computer from the internet.

4. Next, right click on the Windows start button and click Device Manager.

In Device Manager, Under Sound Video & Game Controllers, Right click the “Realtek 2832U device” and

uninstall it, be sure to put the tick in the box to delete driver software.

If you don't find a driver there, then just close out the Device Manager.

5. Now you can install the correct driver, version 64.1.521.2012 dated 21-May-12

The wrong not working driver installed by Windows is dated 2009 or 2010.

When you unzipped Treiber2, it created a file folder called 86.001.0521.2012. Open this folder and click on the "setup" application to start the installation. The driver will be stored in:

C:\Program Files (x86)\Realtek\REALTEK DTV USB DEVICE

6. You can check the installed driver version by right clicking on "REALTEK 2832U Device" in Device Manager and clicking Properties and then Driver.

7. Now it is time to try it out and see if your dongle really works. For this I used the program VLC. See below for a separate description on how to use VLC with the TV tuner.

8. Assuming you got the dongle working, then re-connect your computer to the internet. After a few minutes windows will update the working 2012 driver with the not working 2009 driver again.

9. To reinstall the 2012 driver and stop this happening again: In Device Manager, Under Sound Video & Game Controllers, Right click the Realtek 2832U Device then click "Update Driver", Click "Browse My Computer for Driver Software", Click "Let me pick from a list of available drivers on my computer". This will now show a list with both the bad 2009 and the good 2012 drivers Click on the 5/21/2012 driver so it is highlighted.

   Then click on NEXT. This then reinstalls the correct driver. It also prevents Windows from replacing it automatically.

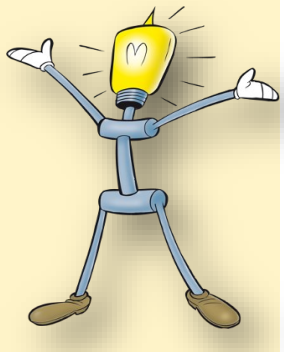
~ 73 de Jim, KH6HTV

Interested in Amateur Radio Television (ATV)?

Check out these freebies

NEW FREE DVD – "Amateur, High Definition, Digital TV" talk presented at Micro-Hams Digital Conference, 9 May 2020 (send request to kh6htv@arrl.net)

NEW FREE BOOK – "ATV HANDBOOK – an Introduction to Amateur TV" — AN-55 ATV Handbook



Amateur television (ATV) is the transmission of broadcast quality video and audio over the wide range of frequencies of radio waves allocated for radio amateur (Ham) use. ATV is used for non-commercial experimentation, pleasure, and public service events. Ham TV stations were on the air in many cities before commercial television stations came on the air. Various transmission standards are used, these include the broadcast transmission standards of NTSC in North America and Japan, and PAL or SECAM elsewhere, utilizing the full refresh rates of those standards. ATV includes the study of building of such transmitters and receivers, and the study of radio propagation of signals travelling between transmitting and receiving stations.

There is now a DATV downlink on the ISS operating in the amateur 2.4 GHz band. The QO-100 geostationary satellite wideband transponder has DATV uplinks in the 2.4 GHz and downlinks in 10GHz amateur bands.

ATV is an extension of amateur radio. It is also called HAM TV or fast-scan TV (FSTV), as opposed to slow-scan television (SSTV).

Other information

The distance record for ATV is between Hawaii and California (2,518 miles) on 434 MHz.

Experiments with digital modes have lagged somewhat behind those in Europe, but have taken on some new urgency given the transition of broadcast television.

A low-cost approach to starting with ATV

The following are excerpts from "*How to Receive Amateur Digital, DVB-T Television Signals*" https://kh6htv.files.wordpress.com/2011/09/an-21b-receive-dtv-revfeb20161.pdf, written by Jim Andrews, KH6HTV. Jim answers the fundamental question "How can I receive amateur DTV signals?" which describes the various methods by which ATV may be used. The dongles are familiar to many of us already, and being used for multiple receiver applications.

The DTV system adopted by Boulder, Colorado and other Colorado Front Range radio amateurs is called DVB-T, or Digital Video Broadcast - Terrestrial. It is NOT the ATSC (8-VSB) system used in the USA for commercial TV broadcast over the air, nor for transmission in cable TV (CATV). It is the system developed in Europe and used by most of the rest of the world for broadcast DTV. Thus, in the USA, you can NOT directly use your home TV receiver to receive DVB-T. The reasons, we have adopted a European standard rather than an American standard are primarily based upon cost and availability of transmitting equipment and also on the superior multi-path performance of DVB-T over ATSC.

Although multiple methods are described, it appears that the really low cost approach is to buy a DVB-T TV Tuner USB dongle for your

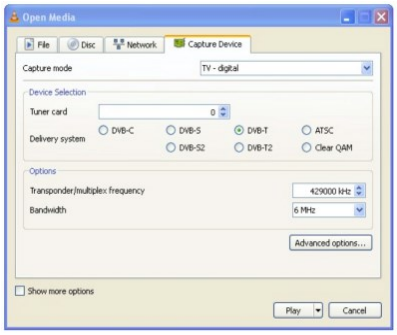
PC computer. Most of the "hits" from a Google search for DVB-T receivers will in fact be these dongles. They are found from many sources on www.ebay.com and www.amazon.ca among others. Most of these seem to use the same basic design with an R820T DTV tuner IC (www.rafaelmicro.com) and an RTL2832U DVB-T COFDM demodulator IC with a USB interface (www.realtek.com)

The tuner's frequency range is 42 to 1002 MHz with a 3.5 dB noise figure. These same dongles have been used by amateurs as generic software defined radio (SDR) receivers for many other RF applications, such as a spectrum analyzer, with appropriate software.

These dongles typically come with a small mag-mount whip antenna, remote control and a mini-CD disc with TV tuner software. The RF connectors vary and sometimes are not what are shown in the internet advertisement photos. The antenna connector is usually a small MCX or the larger European TV antenna connector, called the Belling-Lee (IEC 61169-2). Most USA amateurs are not using MCX or Belling-Lee connectors. We have made our own adapters by simply cutting off a connector pigtail from the supplied mini antenna and installing another connector of our own choice on the other end of the pig-tail. Suitable coax adapters are also available on the internet.

This is not a simple KISS, turn-key, solution such as found with the purchase of a set-top box receiver. A PC computer, and attendant computer skills are required to use this approach.

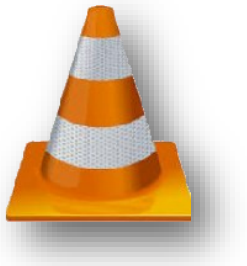
All of the cheap, USB TV tuner dongles seem to came with free TV tuner software by Blaze Video (www.blazevideo.com) now no longer supported. It only runs on Windows PC computers. I have heard very mixed reviews from other hams about Blaze. I myself have had all sorts of issues trying to get it to work on several computers and with several dongles. It seems to work or not work depending upon which version of Windows one is using. Some hams have had it work for a couple of weeks and then lock up and never work again. Others have reported it to work fine for over a year or more. Some hams have reported that the software is extremely slow in responding to commands. VLC Works! Steve, WB0NFQ, has discovered that the general purpose video processing software called VLC (www.videolan.org) works great with these USB TV Tuner dongles. VLC is a free and open source cross-platform multimedia player. VLC is available for Windows, Mac OS X, Linux and Unix. The Windows version does work with these dongles. The Mac version does not support these cheap, generic dongles. It only supports expensive Eye TV tuner dongles (https://www.elgato.com/en/eyetv). The photo is an example of VLC receiving an amateur DVB-T signal on 429MHz.



See the article on the next page for more on the use of VLC for ATV.

[Editors note: The RTL-SDR dongle and software were created for European systems and are not suitable for broadcast TV in North America. As described, Amateur TV uses a lower bandwidth that can be configured for compatibility. For full NTSC bandwidth other hardware and software solutions are available.]

One free program to run a USB TV Tuner dongle is VLC



The Boulder Amateur Television Club TV Repeater's 'REPEATER' is a free newsletter distributed electronically via e-mail to ATV hams. The distribution list has now grown to over 400. All past issues are archived at: https://kh6htv.com/newsletter/

BATVC web site: www.kh6htv.com

ATN web site: www.atn-tv.com

Jim Andrews, KH6HTV, editor - kh6htv@arrl.net

VLC Media Player is a powerful media player program which will do much more than just run your dongle. It can be downloaded free from www.videolan.org

To check out the operation of your dongle, you need to first supply it with a good DVB-T RF signal. I used my Hi-Des HV-320E modulator hardwired to the antenna input on the dongle. Set at least 20dB of attenuation in the modulator (or use an external pad) to prevent overloading the dongle's tuner. I set my modulator to one of our normal ham DATV channels. It is best to then feed "live" video and audio into the modulator to verify performance. I used a pre-recorded DVD as my "live" A/V source.

1. Launch VLC
2. On the upper taskbar, click on "Media" - select "Open Capture Device"
3. On the Open Media menu, Capture Mode - select "TV-digital"

4. Device Selection - set Tuner card to "0", select Delivery System as DVB-T
5. For Options: enter the center frequency and bandwidth of the test signal you are using. For example, I used 423MHz, but it must be entered in kHz as 423000. It is best not to leave Bandwidth in the default Automatic, but to in fact chose the correct bandwidth. Choices are 1.712, 5, 6, 7, 8 or 10MHz.
6. Now click on "Play"
7. IF everything has been installed correctly, then you now should see your live video being received by the USB dongle. CONGRATULATIONS! You have made it work.

CAUTION: Both Gary, K7HYB, and Pete, WB2DVS, report that the USB dongle will now only work as a digital TV tuner.

It will no longer work as an SDR receiver for other applications, such as SDR-Sharp. If you want to still use these apps, you will need to go into your Windows 10 menu and select a different driver.

OBSERVATIONS on USE: I have tested the dongle with VLC under various digital parameters and it seems to work OK in all cases. I tried it with resolutions of 480i, 720P and 1080P and with QPSK, 16QAM & 64QAM. The max. bit rates ranged from 5.5MB (QPSK), to 11MB (16QAM) up to 17MB (64QAM). I also observed that if the RF signal drops out and then comes back on, VLC will not always reacquire the signal. To reacquire, one needs to first click on the "Stop Playback" button (black square), then click on the "Play" button (right facing triangle)!

~ *Jim KH6HTV*

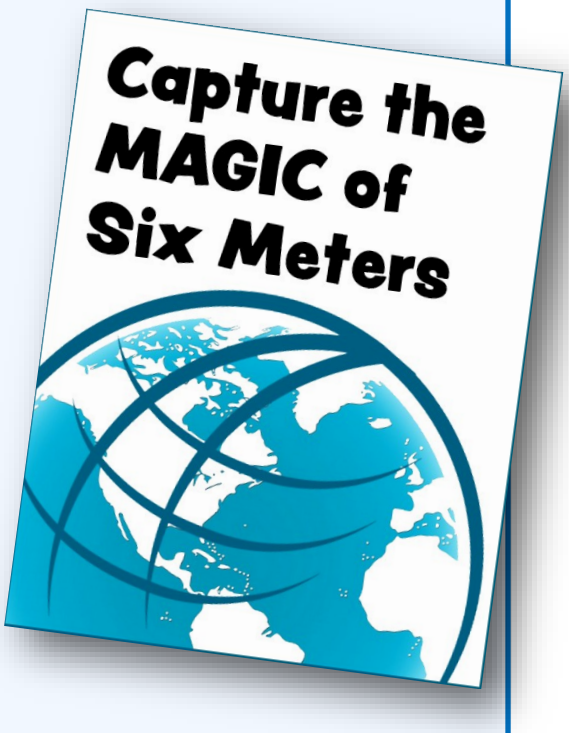
Capture the Magic of Six Meters — Free eBook

Have you ever wondered about the "Magic" of Six Meters? After all, you've probably pressed the six meter button on your rig and failed to find any magic or even any other stations. If that's the case, you've identified the "tragic" of the band. But without tragic there would be no magic.

The subtitle of this book states:

AVERAGE EQUIPMENT + LIMITED ANTENNAS = EXCEPTIONAL QSOS.

It really doesn't take much on six meters — your existing HF+6 meter rig along with a simple antenna, even a dipole, will work. In this book you'll find out how I know that dipoles work along with how to build one of your own.



This book will also provide plenty of insight into how you, too, can "Capture the Magic of Six Meters." It covers propagation, equipment, software, antennas, awards and contesting, as well as assistance in finding the magic.

BTW — If you'd rather read the book online along with lots of links to additional information, you can find it at 6 Meter DXing Guide – Getting Started on the Magic Band. You can also find a presentation at Six Meter Presentation @ ARRL Learning Network. Lots of ways to get this information and get on the band.

Download the book at https://www.k5nd.net/?smd_process_download=1&download_id=5428

~ Jim-K5ND

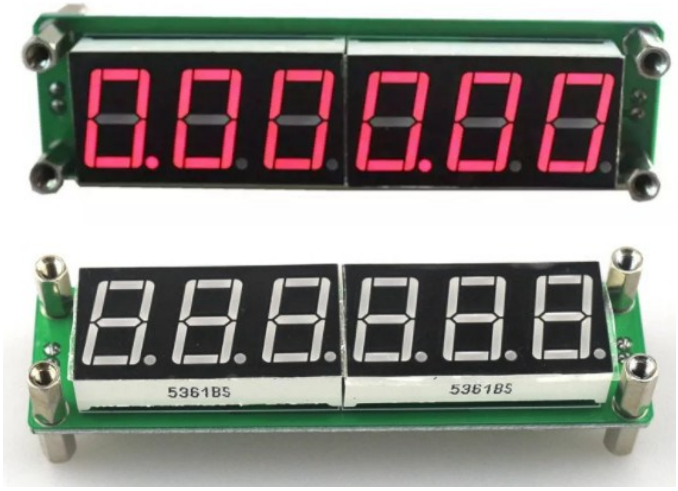
https://www.k5nd.radio

Daniel Romila VE7LCG

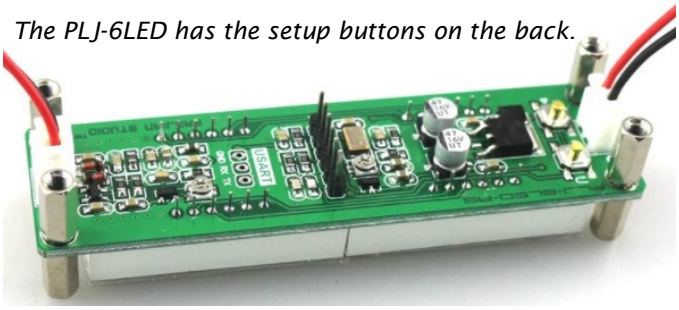
Daniel's Workbench

The frequency meter modules PLJ-6 and PLJ-8 LED

One of the necessary tools for the ham radio shack is the frequency meter. It allows measuring the frequency of receivers, transceivers, and oscillators. Whenever making an analog radio device it makes the difference between trying blindly to find the ham radio bands and being in the know exactly of what is happening.

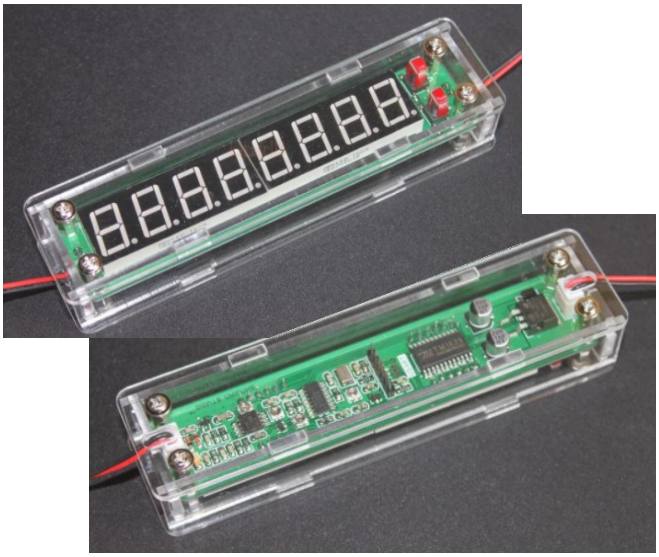


The PLJ-6LED has the setup buttons on the back.



While it is possible to do it oneself, from scratch, being an essential tool it is better to have/also have a frequency meter already functional and ready to use, especially as it costs under C$20 - 25, shipping and taxes included, to have such modules with sensitivity under 60 mV and measuring up to 2.4 GHz.

The cheapest version is PLJ-6 LED and it can be used to measure between 100 KHz (actually down to 20 KHz) and up to 65 MHz, with sensitivity better than 60 mV *[left]*.



The PLJ-8LED is more expensive, capable of measuring between 100 KHz and 2.4 GHz, with an input sensitivity of 60 mV or better:

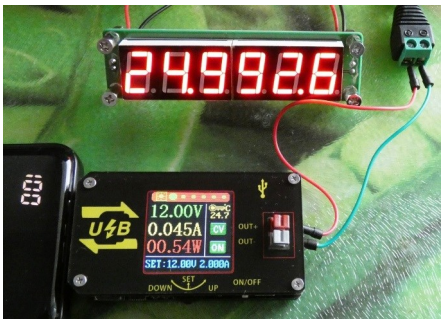
As seen in the pictures, it is possible to buy this version together with a dedicated plastic case. Just route the included wiring, solder a power connector for a pair of wires, two crocodiles for the other pair of wires, and here you have a lab frequency meter to be used for whatever you build on the breadboard and prototyping board. The setup buttons face up.

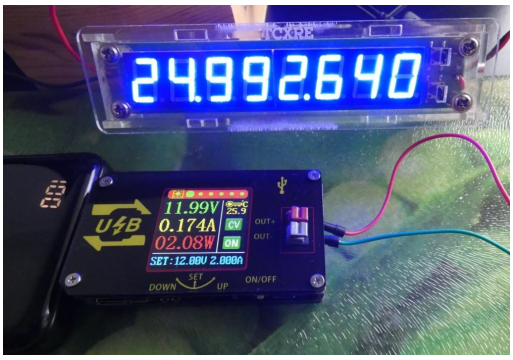
Both PLJ-6LED and PLJ-8 LED come in red, green, yellow, and blue colors of the LED segments. The intention of Sanjian Studio, when it made those modules, was to make them frequency scales, not only frequency meters. So, they can add or subtract two different intermediate frequencies, adjust the brightness on 8 levels, and decide two lengths of the displayed frequency. This is supposed to work automatically, but that is not reliable and it is better to be set in the menu.

Since I use one of my modules as a general lab frequency meter, I set it with all digits displayed. It is also possible in the menu to activate a filter for everything under 100 KHz. By setting this option OFF one can measure less than 100 KHz, but my observation, and that of other reviewers is that under 20 KHz it is less usable, and the cut off where I no longer use it is 10 KHZ, because the digits showing the Hz never stabilize. I suppose this is because of a very short time for gate time (input) of 0.1 seconds. This chosen value makes a very pleasant fast display for ham radio band frequencies, which are above 20 KHz, anyhow.

The required power supply must be between 9V and 15V. I work with the standard 12V. I noticed there is a 7805 voltage stabilizer and a protection diode in series on the PCB, so I wanted to measure and see how much it would heat this stabilizer and diode.

The PLJ-8LED module I have, used at the 3rd level of light intensity (3 from 8), consumes 174 mA at 12V. That means the 7805 stabilizer integrated circuit dissipates 0.174mA X (12V – 5V) = 1.218 Wats. This is already a high value for the stabilizer, although it is a medium version of the 7805, not the minimum one. A part of the calculated dissipated power above falls on a protection diode, but still, there is more than 1 Watt on that stabilizer 7805 IC. I set the brightness at the value 2 from 8, and the intensity went down to 82 mA. That means 0.574 Watts on the protection diode and the 5V stabilizer, a safer value.





I found the frequency measurements with both modules to be reliable and consistent. I have only quartz oscillators, not something special to calibrate with. It was encouraging to see the same value shown on both modules. On the board, there is a semi-adjustable capacitor for the clock frequency, but I felt it was better to leave it in peace, as it was set by the manufacturer.

Both modules are based on PIC microcontrollers, and the 8 LED version has a pre-scaler in it.

A very detailed and somehow too critical 26-minute review about PLJ-8LED can be found at:

https://www.youtube.com/watch?v=WWy0821JLUQ

A 7 minute review and demo about PLJ-6LED can be found at:

https://www.youtube.com/watch?v=1_neC5Z_wEg

The user's manual for PLJ-6LED can be found at:

https://www.mpja.com/download/35057tebasic%20manual.pdf

The user's manual for PLJ-8LED can be found at:

https://www.mpja.com/download/34279temanual.pdf

https://www.zl2pd.com/files/PLJ-8LED_Manual_Translation_EN.pdf

https://www.manualslib.com/download/1522425/Sanjian-Studio-Plj-8led-C.html

~ Daniel VE7LCG

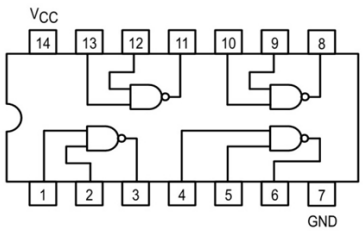
Daniel Romila VE7LCG

Daniel's Workbench

...continued

Crystal Oscillators with SN7400 and SN7404

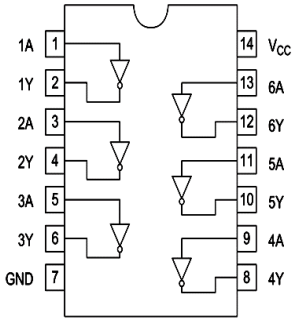
SN7400 and SN7404 are TTL logic circuits. They are logic gates made with bipolar transistors and function with power supplied at 5V. There are versions with other values for the power supply, but 5V still is a common voltage used for logic gates.



SN7400 and its versions contain 4 NAND gates inside the integrated circuit. A NAND gate means NOT AND. Both inputs need to be TRUE in order for the output to be FALSE. Any other combination of inputs gives a TRUE output value.

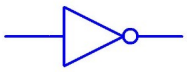
The datasheet can be found at:

https://www.ti.com/lit/ds/symlink/sn7400.pdf?HQS=TI-null-null-mousermode-df-pf-null-wwe&ts=1605663838917&ref_url=https%253A%252F%252Fwww.mouser.ca%252F



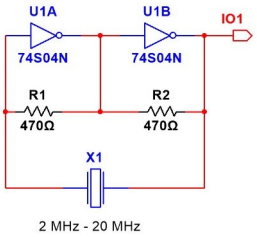
SN7404 and its versions contain 6 NOT gates. The output is the negated value of the input, that meaning FALSE for TRUE input.

SN7404 is interchangeable with SN7400, meaning that shortcutting the inputs from the NAND gates (SN7400) would make a NOT gate, like inside the SN7404 *[right]*.

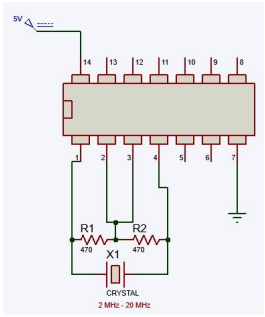


Still, some resistor values work with SN7404 and do not work for an oscillator with SN7400. A simple quartz oscillator can be assembled as shown in the pictures below.

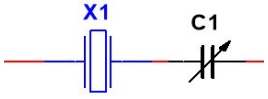
It is reliable between 2 MHz and 20 MHz. Two gates are enough for making the oscillator, and more gates can be connected on the chain at the output, to separate it from whatever destination the output signal would have.



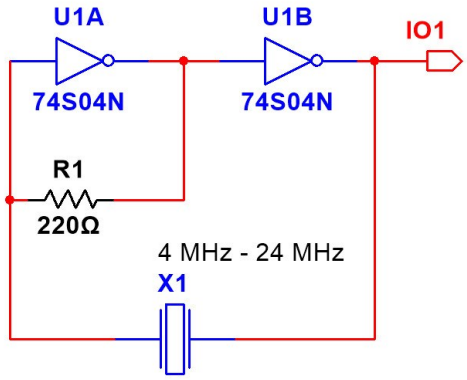
The signal is rectangular, at almost 5V (the power supply value) and has plenty of harmonics. It is easy and fast to make on a breadboard.



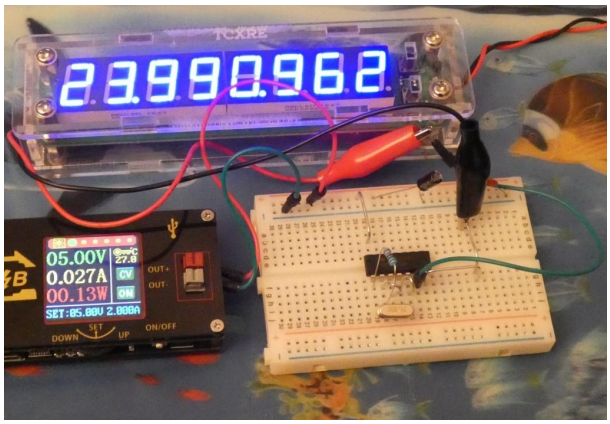
The crystal can be placed in series with an adjustable or semi-adjustable capacitor (something like nominal 15 pF to nominal 50 pF), to fine tuning the oscillation frequency.



The frequency range of usable quartz crystals can be modified to be between 4 MHz to 24 MHz with the following schematics.

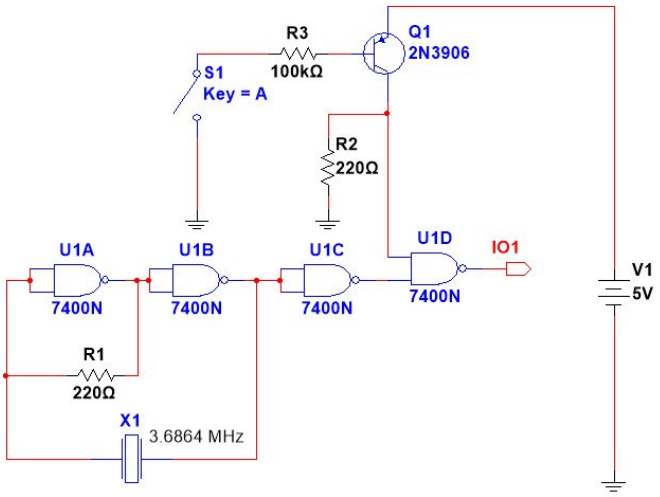


I also succeeded in making 30 MHz crystals oscillate with this schematic, but this is forcing the logic circuits to the extreme for the TTL family I used. The SN7400 series prefer the single 220 Ohm resistor version, and does not like the version with two 470 Ohm resistors.



Using all 4 gates from a SN74HC00N it is possible to make a keyed crystal oscillator.

The oscillator consists of U1A and U1B gates. R1 can be between 220 Ohm and 560 Ohms. U1C gate is used as a separator. The last gate U1D has one input connected to the oscillation signal, so this input varies between 1 and 0



logic. But because the second input of U1D is connected to the ground (0 logic) through the 220 Ohm resistor, the output of U1D is forced into 1 logic (5V), stable. If we connect the switch S1 to ground and shortcut the chain 100 KOhm resistor and the base of the PNP transistor 2N3906, we force the input of U1D into 1 logic. This enables the oscillation coming from U1C to go to the output of U1D. The signal is squared, and almost 5 V peak to peak. It can directly drive a final transistor for 1 – 10 Watts RF output power.

A square wave signal can be useful to switch diodes from a direct conversion receiver, and also to use the high voltage oscillation output for the transmit part of an eventual direct conversion transceiver.

It is a big temptation to try a VFO with the SN7400 integrated circuit. Unfortunately the VFO was not stable even after 10 minutes. It is therefore not usable for ham radio purposes.

A further experiment, attaching a power transistor and making an XO oscillator a full 5 Watt transmitter can be found at: http://sm0vpo.altervista.org/tx/5watttx.htm

~ Daniel VE7LCG

Daniel Romila VE7LCG

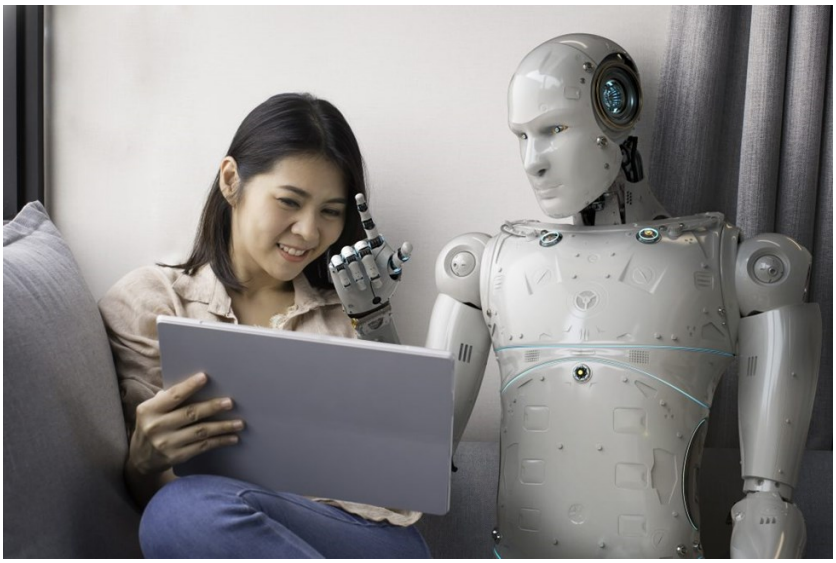
Daniel's Workbench

...continued

Why I never went down the Raspberry Pi road

A technical, but more poetic version of the idea I express here, without any mention of the Raspberry Pi can be found in the article "How Humans Tell Robots What to Do", by Brian Hellman at

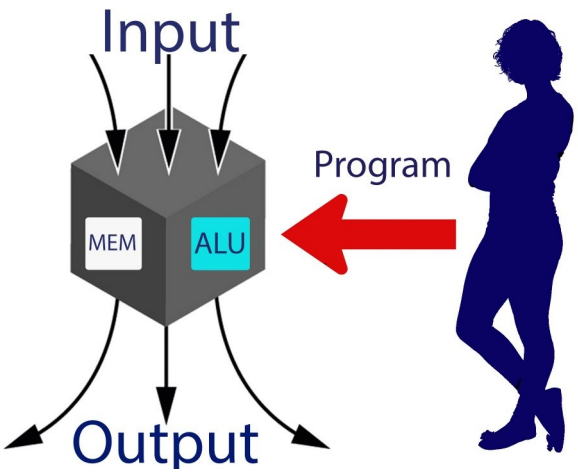
https://www.roboticsbusinessreview.com/news/how-humans-tell-robots-what-to-do/



Short answer: the ratio of price vs what it knows to do is not great, and it was never great. Worse, I do not need it. It is a programmable system in the middle of the road between a 2-3 buck microcontroller board and a 150 buck full computer with a Windows/Linux/Android operating system. While it is a fun programmable system to work with, I could not justify the price, the learning of yet another system, and the size. Yes, the size (keep reading).

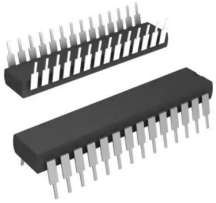
Context: For those that never touched this kind of system, my article is about systems that can be programmed by a human user to do something. It can be something very simple, like switching ON a LED when it is dark outside. It is a programmed thing, using hardware. It would be easier to just implement it in hardware, without any software, for the before mentioned LED in the dark example. True, but this is not the point. Such programmable systems can be programmed to do various things, can be reused again and again, for simple processes like switching ON a LED in the dark, up to running a radio repeater, decoding audio MORSE code to display it on an LCD screen, and so on. Some programmable systems can be used as everyday computers and yes, your laptop is indeed one of the programmable systems that we are talking about, which is – believe it or not – in the same family as a small Arduino Nano board that costs several bucks. Same gizmo, the same principle of functioning, just a different level of complexity. You can also call it a robot, and you are not mistaken at all – it fits all the definitions.

To represent it in a picture, a programmable system, like Raspberry Pi has the following general representation/diagram (I made it myself from pieces):



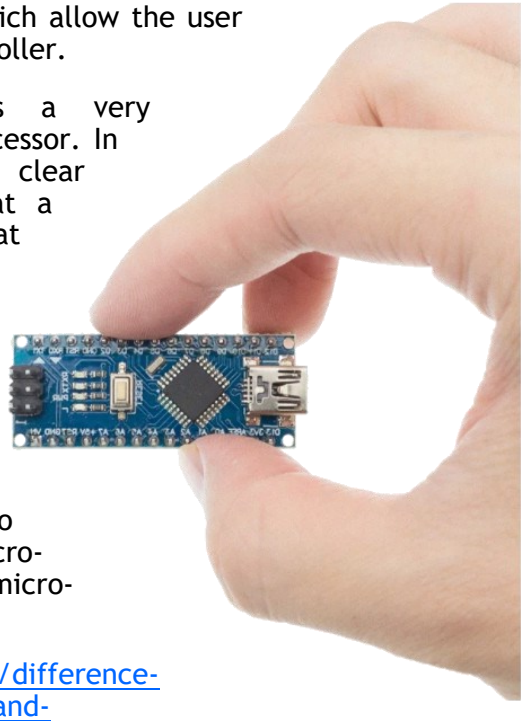
A human writes a program to solve a certain process, which is introduced into a programmable system, capable of memorizing the program and other data (MEM = memory) and doing arithmetic and logic functions as defined in the program with an ALU (Arithmetic and Logic Unit), on various inputs and outputs, which can be analog and/or digital (This can also include analog/digital conversion capabilities).

The above diagram, in its most basic operation, can be implemented in a single integrated circuit, called a microcontroller.



To program it, and make it re-usable for various processes we want to implement, an integrated circuit such as this needs to be mounted on a developer board, which allows easily accessible physical and logical electrical connections.

Surface-mounted technology is used for making everything cheaper, but traditional through the holes components/microcontrollers are also used, together with sockets which allow the user to remove the microcontroller.



The microcontroller is a very stripped down micro-processor. In the past, there was a clear separation between what a microprocessor is and what a microcontroller is, but this separation became more and more blurred in microcontrollers and microprocessors made in 2020 and the immediately preceding years. The article written by Guru 99 tries to differentiate between micro-controllers and micro-processors:

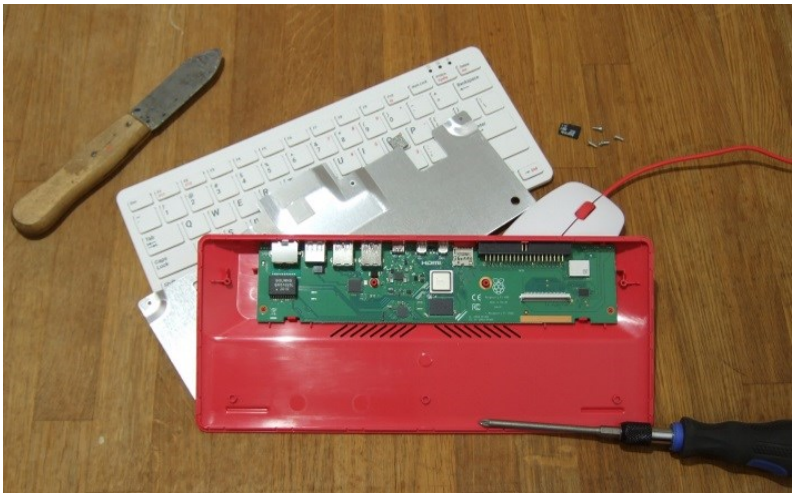
https://www.guru99.com/difference-between-microprocessor-and-microcontroller.html#:~:text=KEY%20DIFFERENCES,all%20integrated%20into%20one%20chip.&text=Microprocessor%20uses%20an%20external%20bus,uses%20an%20internal%20controlling%20bus.

But microprocessors nowadays have “big” (several megabytes) cache memory on them, so what Guru 99 says about microprocessors not having a memory is not quite true.

Comparison with systems in the same price range as Raspberry PI: In its last iteration, in November 2020, Raspberry Pi 400 is a keyboard with a development programmable board in it. It is so new that Wikipedia does not have information (yet) about this last model. It is a full computer with Input and Output pins, in addition to the USB, HDMI, network, and other ports your normal laptop has. It is not a very powerful computer, but it gives simple access to Input/Outputs like simple wires. Your normal computer does not want you to have such access.

On November 2nd, 2020, Elliot Williams reviewed it and took it apart:

https://hackaday.com/2020/11/02/new-raspberry-pi-400-is-a-computer-in-a-keyboard-for-70/



It costs US$100 for the whole kit, and US$70 for just the Raspberry Pi 400 board; and it looks very different from the traditional Raspberry Pi board *[left]* which has an approximate size of 65 mm × 56.5 mm (2.56 in × 2.22 in).

The full specifications for each Raspberry Pi board can be found at https://www.raspberrypi.org/

In a similar size (62 mm x 62 mm x 42 mm), weighing 121 grams, one can have a full computer XCY Mini PC Intel Celeron N4100 Quad-Core 8GB LPDDR4 128GB SSD 2.4G/5.0G WiFi Bluetooth 4.2 HDMI2.0 60Hz 4K Computer running Windows 10. The cost is double, and the processing power more than double.

If you are looking for something in the same price range, or half the cost, here are several options:

The Pocket PC W5 Pro has an Intel Atom Z8350 CPU, 4 core 4 threads,64 bit, 14nm 1.44GHz up to 1.92GHz, 2M cache, Intel HD Graphics 400 GPU, support 4K @ 30Hz, RAM: 8GB LPDDR3, ROM: 128GB eMMC, supports Windows and Linux operating systems, 2.4GHz + 5GHz dual-band WiFi, fast and stable network access at only 65g.

People buy such sticks to insert them into the HDMI plug of a big TV and make it a 4k media center, but also to insert it into small portable LCDs and have a very portable

computer. If compared to the size of a cellphone:

A fairer comparison would be to compare the Raspberry Pi system, which is based on an ARM processor, with something else also based on the ARM processor. An Android TV stick, similar to the previously described Intel-based stick, costs around C$70-80 (shipping and taxes included).

It is an Android TV Box: X96S X96 Stick - 4K TV Stick Android-9 4GB RAM, 32GB ROM, Armlogic S905Y2 Quad Core with Wifi BT 1080P H.265 4K 60fps TV Dongle.

Those TV sticks do not yet have DDR4, and still contain the older DDR3 type of RAM.

There are plenty of cellphones and tablets with ARM processors at the same price as a Raspberry Pi 400, with the advantage of already being a compact portable system, with battery, buttons, and LCD in them.

But what about the Input/Output pins Raspberry Pi has, that obviously those more powerful and cheaper systems do not? Well, in most of the Raspberry projects they are not used. Anyhow, a simple Arduino Nano board and similar (something like C$2-3), can be used for incredibly complex I/O, with Firmata, for Windows, MacOS and Linux system computers, as those described above.

> *"Firmata is a protocol for communicating with microcontrollers from software on a host computer. The protocol can be implemented in firmware on any microcontroller architecture as well as software on any host computer software package."*

https://github.com/firmata/arduino

If this is not enough for your needs, what about a dedicated USB interface for I/O, from National Instruments?

The USB 6008 is a low-cost, multifunction DAQ device. 8 AI (12-Bit, 10 kS/s), 2 AO (150 Hz), 12 DIO USB Multifunction I/O Device.

What does it mean to go down the Raspberry Pi path

Of course, this means to use or try to use the Raspberry Pi for something. From Wikipedia:

> *"The Raspberry Pi Foundation provides Raspberry Pi OS (formerly called Raspbian), a Debian-based (32-bit) Linux*

distribution for download, as well as third-party Ubuntu, Windows 10 IoT Core, RISC OS, and LibreELEC (specialized media center distribution). It promotes Python and Scratch as the main programming languages, with support for many other languages. The default firmware is closed source, while unofficial open source is available. Many other operating systems can also run on the Raspberry Pi. Third-party operating systems available via the official website include Ubuntu MATE, Windows 10 IoT Core, RISC OS and specialized distributions for the Kodi media center and classroom management. The formally verified microkernel seL4 is also supported."

On the Internet, you will find articles describing many projects based on "single board computers" like Raspberry PI. For example, a good website to start with is https://projects.raspberrypi.org/en

Ham Radio projects can be found on YouTube and websites. According to James Stevens M0JCQ (and I agree with him) the Top 10 Amateur Radio Uses for the Raspberry Pi:

- Decoding Data Modes.
- Remote Software Defined Radio (SDR).
- WSPR Transmitter.
- Amateur Satellite Tracking.
- Digital Voice (DV) Hotspot.
- APRS I-Gate.
- ADS-B Flight Tracker
- Rotator Controller.
- Retro gaming machine.
- Media Center

http://www.hamblog.co.uk/top-10-amateur-radio-uses-for-raspberry-pi/

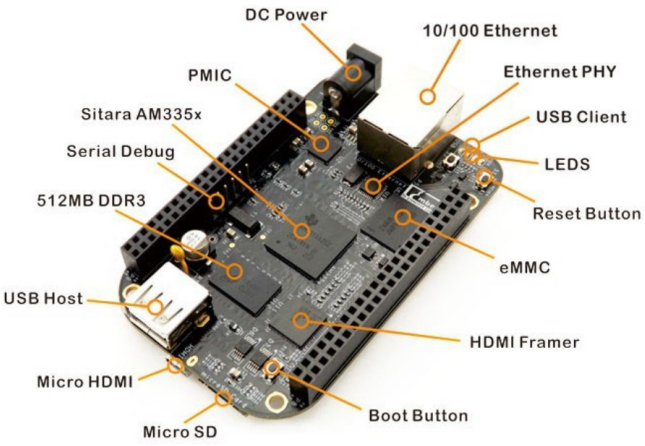
Why I did not go down the Raspberry Pi path?

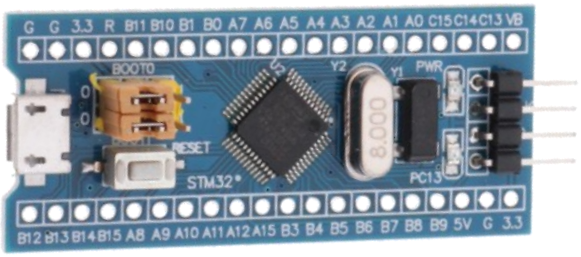
I do not need it. I cannot justify spending money on it. I cannot justify spending the time on it since the same time can be better spent on other ham radio and general electronics projects. Time is limited. I cannot do everything that's cool, especially if I do not need it.

From the above list, I already have a media center, on a dedicated Windows 10 Media Center. It is difficult for someone to argue with me that running a media center is comfortable in Windows 10. Everyone can install a new audio-video player. There are plenty of them for Windows 10. Plenty of codecs. Plenty of power to go on streaming websites, like YouTube and many others. An easy interface to all kinds of displays and TVs, with all kinds of audio amplifiers, with analog and digital inputs.

Every time I think about going into Raspberry Pi I think about the money I have to spend upfront. After several months, when I'm finally knowledgeable enough to develop something myself, more than simply copying the work of others, the Raspberry Pi version that I bought would become obsolete. Another, more powerful version would be out there, with differences that will force me to learn new things again.

Should I learn Raspberry Pi or other single board computers, like Beaglebone? *[photo next page]*





Beaglebone [left], and Blue Pill STM32F103C8T6 - ARM processors based [right]

One might immediately ask me why I did not apply the same thinking to Arduino. I did. Arduino UNO and Arduino NANO boards have been a stable presence for many years now. While new versions of Arduino Boards appeared (actually not so many of them) the same projects that could be done some years ago can still be done today. The Arduino platform has longer longevity than Raspberry Pi boards have. One can use an older version of Raspberry PI, and it still works, but everyone will point out their obsolescence. Obsolescence affects many more systems that are capable of powerful processing. That being said, even Arduino boards have competition in the new similar boards based on ARM processors, like STM32F103C8T6, which are more powerful and cheaper than Arduino Nano boards. And let's not forget that the Arduino system itself replaced previous, not so successful products, like Basic Stamps.

I never had anything against Raspberry PI. I've simply not needed them so far. That could change even between the writing and published date of this article. I encourage everyone to have fun and play with this general family of programmable systems, to which Arduino and Raspberry Pi belong. Especially applications used with Linux will easily migrate into Raspberry PI.

~ Daniel VE7LCG

Daniel Romila VE7LCG

Daniel's Workbench

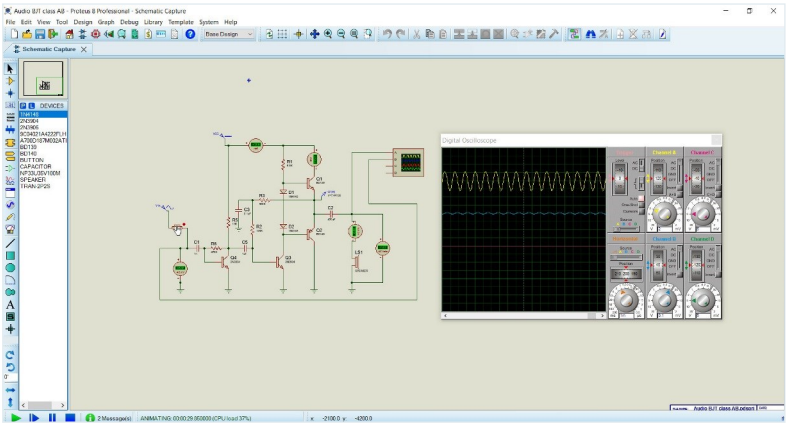
...continued

Design, test, and virtually simulate Raspberry Pi systems with Proteus

I wrote this article to convey that there is the possibility to design, test, and simulate Raspberry Pi systems, with various generations of boards and a bunch of emulated virtual peripherals (called hats for Raspberry) with computer-assisted design packages, like Proteus.

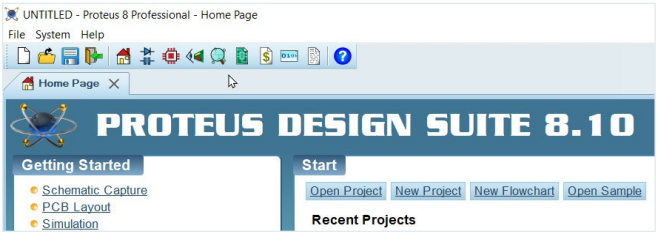
According to Wikipedia, *"The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. It was developed in Yorkshire, England by Labcenter Electronics Ltd and is available in English, French, Spanish and Chinese languages."*

For example, I designed and tested an audio amplifier with four transistors.

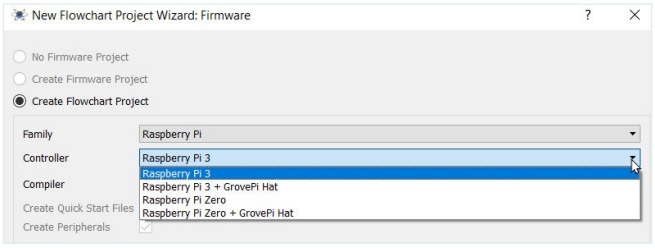


Proteus 8.10 has built-in the ability to design and simulate programmable systems like Arduino and Raspberry Pi. I went into detail, step by step for Arduino, in the article "Simulating a CW keyer made with Arduino Nano" published in the April 2019 Communicator, page 41.

To start a new Raspberry Pi flowchart, one has to choose "New Flowchart".

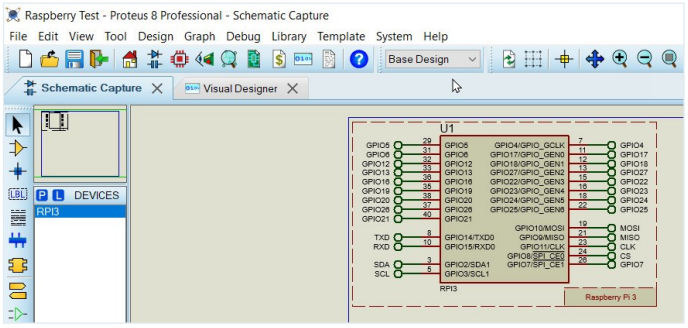


The choices for the kind of Raspberry module to work with is still limited. There is no Raspberry Pi 4, nor 400.

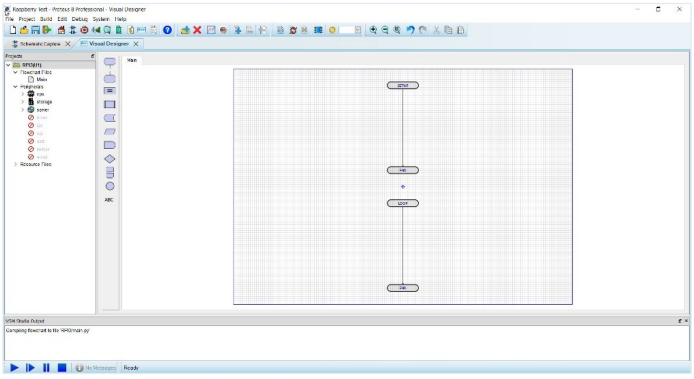


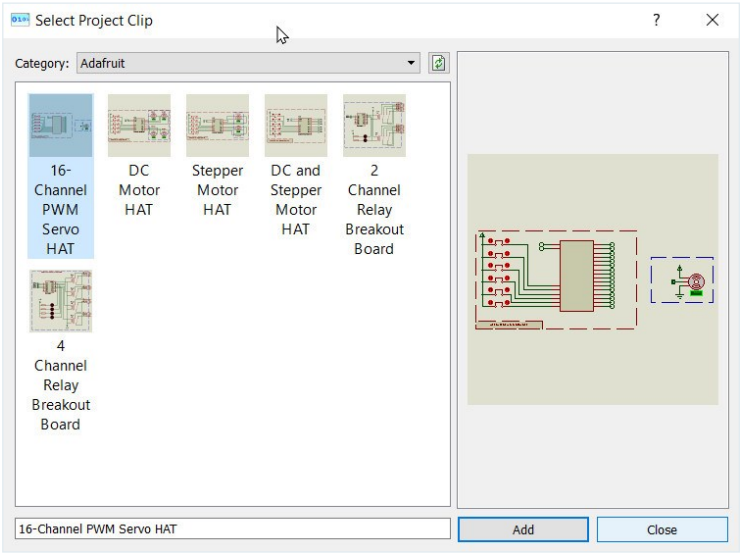
The workspace will have two components:

- The schematic capture



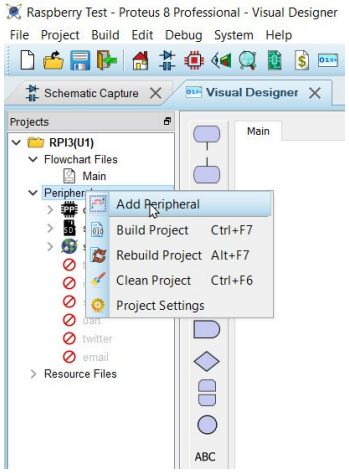
- The visual designer, where we practically do the programming





If we right-click "Peripherals *[diagram right]*.

We have several options to work with *[diagram top right]*.



Whatever peripheral we add, it will be seen only in the schematic view tab. The electrical connection between the Raspberry Pi module and those peripherals are made by simply identically naming the pins that must be electrically connected. In the flowchart, we can add logic actions, like IF logic, with what will happen for the YES and the NO branch.

Since my knowledge of Raspberry Pi is limited, the article ends here, with an invitation for the reader to continue to play in Proteus. A very short (3 minute) and to the point video tutorial, easy to reproduce, was made by the producer of Proteus, Labcenter Electronics Ltd. at https://www.youtube.com/watch?v=sO9Yz65dT3U

It is a complete example of lighting a LED with a push button, from starting a new project, making the schematics, and simulating everything that was done.

The result of such a design, test, and simulation with Proteus can be a file, put on an SD card, inserted into a real physical Raspberry Pi, and work with it in a real situation.

The user needs to keep in mind Raspberry Pi is just another programmable system, with its advantages and disadvantages. It is always useful to see the forest from the tree, and in this particular case, it is about keeping in mind that Raspberry Pi, like Arduino and others, are just programmable hardware, which we might get used to and love, with various software tools that we love and hate. The same real-life function can be implemented with a large variety of programmable systems. In the end, it is about what is fun for the user to work with.

~ Daniel VE7LCG

Daniel Romila VE7LCG

Daniel's Workbench

...continued

Running Raspberry Pi Operating System on a PC as its live non-installed operating system

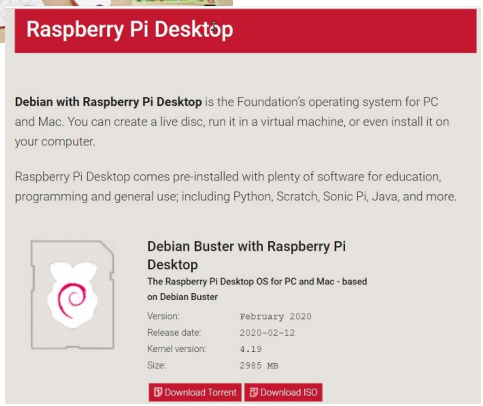
The last iteration of Raspberry PI, the 400 one from 2020, is a keyboard containing the Raspberry module. In its full kit version it comes with a mouse, too, SD card, and it just wants to be connected to a monitor and internet to be a full computer, as reviewed by Jeff Geerling at: https://www.youtube.com/watch?v=3A7pQN5W08E

For those of you wanting to play with Raspberry Pi without buying it, or simply just have a faster Raspberry Pi on which to do the programming, it is possible to run it on a PC using a USB stick from which to boot – because it will boot directly into the Raspberry Pi OS when you choose to boot your PC from the USB memory stick prepared as described in this article. Please keep in mind it is just about the software, not the hardware.

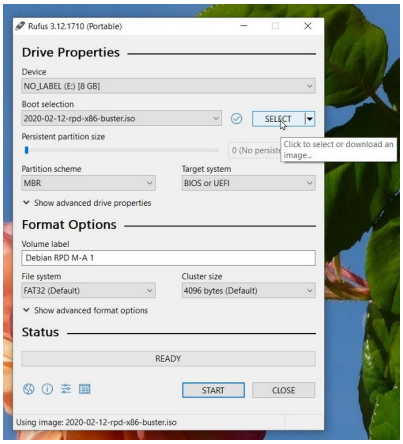
Let' get first the .iso file from https://www.raspberrypi.org/downloads/raspberry-pi-desktop/

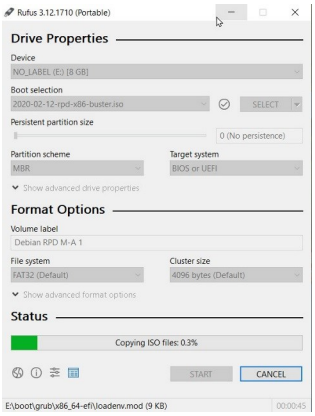
The file *2020-02-12-rpd-x86-buster.iso* is 2.9 GigaBytes. We need a utility in order to make a bootable USB stick containing Raspberry Pi OS. The USB stick should be at least 4 GB. I am using the Rufus 3.12 portable utility, from https://rufus.ie/.

Double clicking the executable Rufus file, with the USB stick plugged into one of the computer's USB connectors load the screen below.



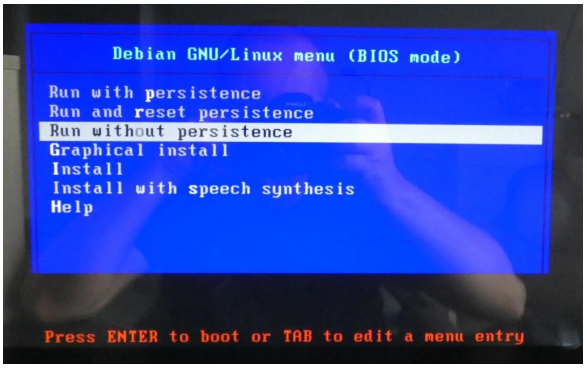
I clicked "Select" and found the Raspberry Pi OS .iso file. Click the "START" button:



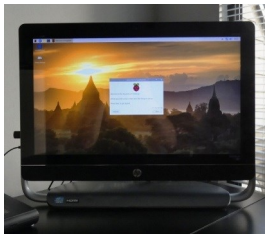


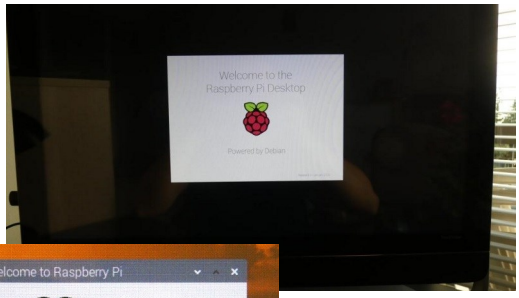
It will take several minutes for the process to finish. Now we can switch OFF the computer and boot from the newly created USB stick.

Each computer has its own procedure for the boot sequence, so I cannot describe the details in this article. Also, generally, the computers are set up to try to boot from whatever would be bootable on any of the USB plugs before booting from the internal hard disk. So, after booting from the USB stick, the following welcoming screen appears.

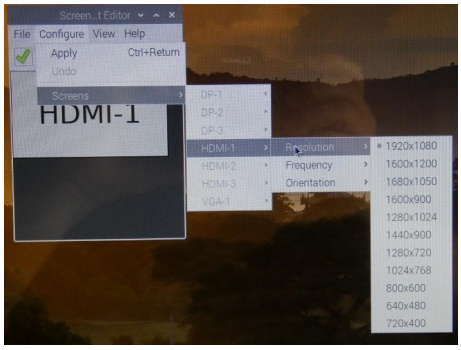


Choose “Run without persistence”, which means to run it as a live Linux distro. Seeing the Raspberry Pi logo means the operation succeeded.

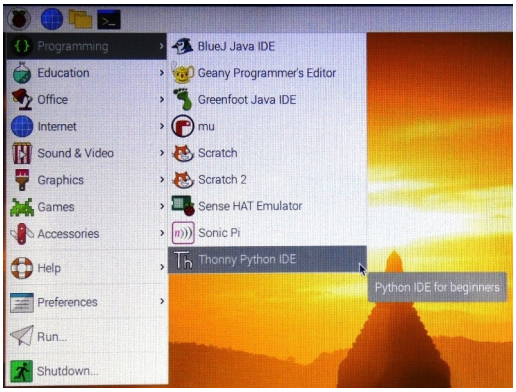




The Raspberry Pi OS recognized even my video card and my display as being capable of full high definition resolution, 1920 x 1080



The expected programs are there and working



Raspberry Pi OS is a Linux distro, a Debian Linux distro, and everything written in this article can be applied to any other Linux distro, just by changing the .iso file put on the USB stick.

~ *Daniel VE7LCG*

Daniel Romila VE7LCG

Daniel's Workbench

...continued

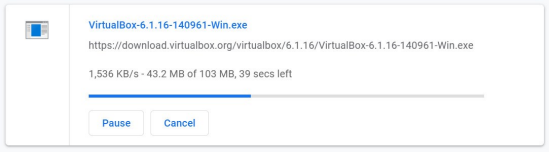
Running Raspberry Pi Operating System inside Windows 10

Taking advantage of Virtual Machines (in the words used by VMWARE software) or Virtual Boxes (in the words used by VirtualBox software) it is possible to run various operating systems inside Windows, Mac OS or Linux. It is like having a computer inside another computer.

I prefer VMWARE over VirtualBox. It is just a personal preference. In this article I will go with VirtualBox, because it is completely free, whereas only parts of the software package are free in VMWARE. It belongs to Oracle, so it is safe to install and uninstall, without problems. The purpose is to obtain a virtual Raspbian machine inside Windows 10 *[photo top left]*.

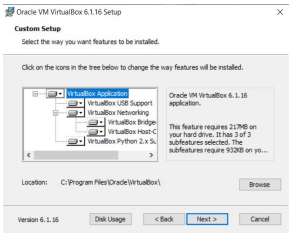
The first step is to download the free Oracle VM VirtualBox from: https://ww.virtualbox.org/ *[photo centre left]*.

One has to click "Download VirtualBox 6.1". This will bring you to the true download page, where you can choose the file to be downloaded according to your operating system. In my case I downloaded the Windows installer *[photo left]*.



It is good to remember where it is downloaded, and after the download is completely finished double click on the executable file. Follow the installation and accept all default settings *[photos lower left]*.

A new icon will appear on the screen to start VirtualBox. But it will automatically start anyway. For the moment we can close it and focus on other things.

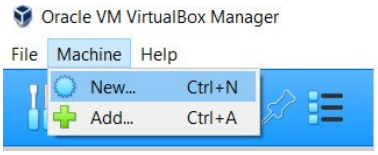


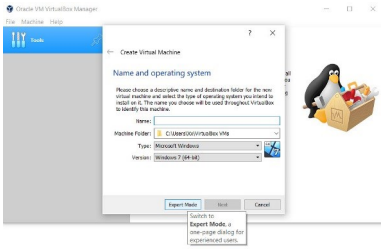
In order to have a virtual machine running Raspberry Pi OS we will have to create a new virtual machine. Luckily, there is someone constantly doing a big part of this work, at osboxes.org. We need to download the virtual disk for our future virtual machine (the .vdi file) from:
https://www.osboxes.org/raspbian/

Download the file

The file is called Rpi-201909-VB-32bit.7z and it is a compressed file. We will need to decompress this file, which will create nested folders, but we only need the decompressed Raspbian 2019-09 (32bit).vdi file, which is big at 6.78 GB.

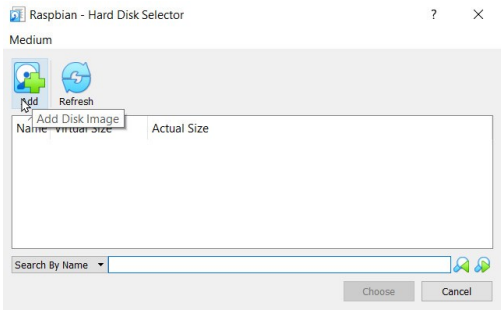
Let's make a new virtual machine.





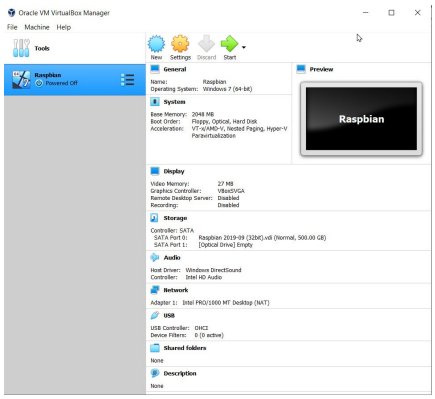
We need to switch into expert mode.

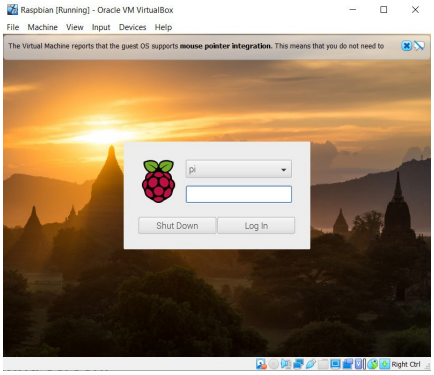
Let's name the new machine Raspbian and select down "Use an existing virtual hard disk file". Go to the lower right corner and add the virtual disk image you downloaded (the .vdi file).



Create the new machine, by clicking the "Create" button. I used the default setting. Verify you have the same settings as I per the following screenshot.

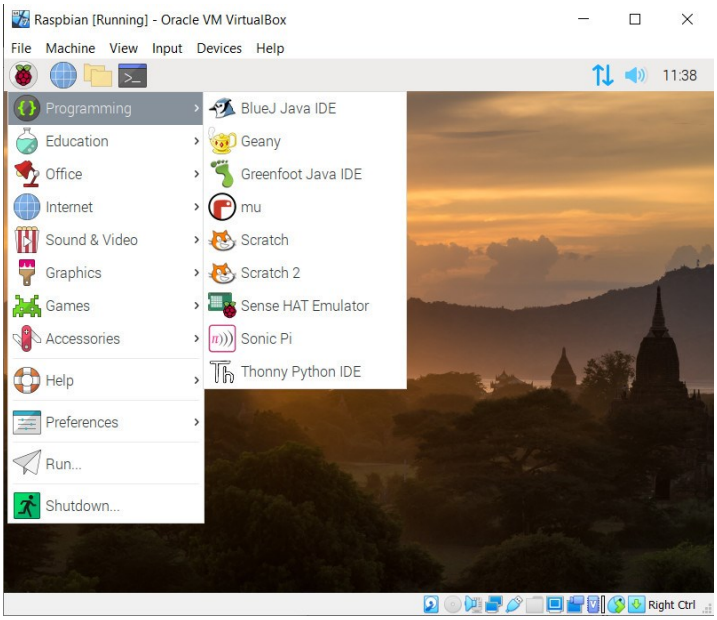
The virtual machine starts when you double click on it. Ignore any message from the next screens about capturing your mouse and keyboard strokes. Either you select the first Debian option, or you simply do nothing and, after a while it will automatically go to this screen:





The password is osboxes.org

By default the Raspbian machine toolbar is on the upper side. You now have a full Raspberry Pi Operating System, and most important, you have access to Python and Scratch programing utilities.



One can play with the size of the window in which this virtual machine is shown. You can make it full screen, scale it and so on. First look at the shortcuts (combination of keyboard strokes), to be able to come back, if you click "View", in the upper bar of VirtualBox emulator software. When they say "Host" key, they refer to the right CTRL key on the keyboard.

One can also play with the settings of the machine, and improve its speed, by adjusting the processor, the video and the allocated memory to the virtual machine.

A similar process as described in this article can be done in VMWARE virtualization software, which is more user friendly (more Windows like, while VirtualBox is more Linux like), but only VMWARE player is free, the full program is not.

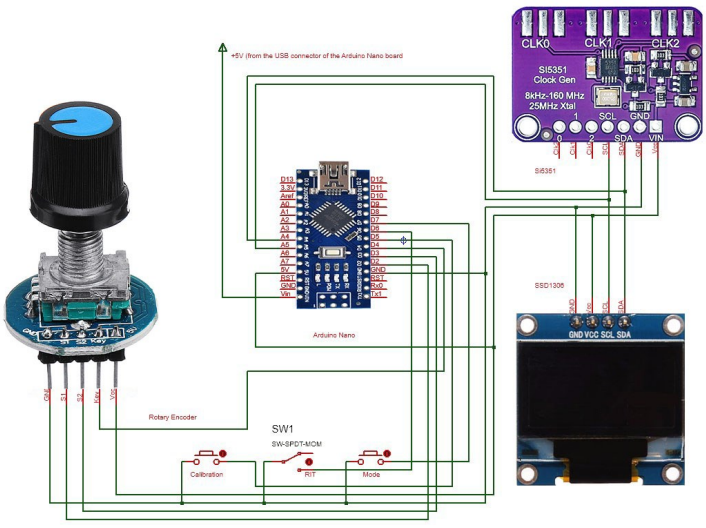
Raspberry Pi OS is a Linux distro, a Debian Linux distro, and everything written in this article can be applied to any other Linux distro.

~ Daniel VE7LCG

Signal generator update

I finally put the sine signal generator (simultaneous different signals 5 Vpp, 3 , 2.5 KHz - 225 MHz) in a case. It is usable only when in the case, with buttons (some in the back), clear schematics, everything in order in folders(s) and backed-up.

(It is not the first one I did; I published it in The Communicator Jan - Feb 2020. The prototype was not very useful without a case. So it took me a year to make another one, with a case. This time I used the code from PA0RWE, with my schematics, because all my modules are at 5V, while his are at 3.3V.)



Now a long rain of articles about direct conversion receivers practical builds, DSB transmitters and SSB filter building will flow towards SARC Communicator, the next editions.

~ Daniel VE7LCG

Ham Shack…

Don Rosberg VE7DXE

My Contribution to Canadian Amateur Radio

A new buy, sell and trade website

I've been involved in amateur radio since 2002. One of the aspects of the hobby that I've found enjoyable is the comradery and social aspect of the hobby apparent at the numerous ham radio buy and sell functions that I've attended over the years. There's nothing like spending the morning at a ham radio flea market hunting for deals on surplus ham radio gear. These popular events provide an excellent forum for ham radio enthusiasts to buy and sell equipment, as well as an opportunity to 'eyeball' on-air amateur friends. Indeed, it's great to put a face to a familiar voice.

Unfortunately, the last in-person ham radio buy and sell event that I attended was held in Chemainus over 10 months ago during the onset of the COVID 19 Pandemic. The event was great. I came home with a Digital Watt Meter; an item that I've contemplated buying for some time. In addition to great deals, there was also lots of chatter about COVID. In hindsight, who would have thought the chatter would result in a 'full-blown' world-wide pandemic affecting us all? Shortly after, Public Health measures were carefully implemented to limit the spread of COVID. Limitations on public gatherings and social distancing rules have temporarily halted popular hamfests, swap and shops and other in-person events, leaving only online sites as a means for licensed ham radio operators to buy, sell and swap equipment. There are a couple of established Canadian amateur radio buy and sell sites. In addition, there are many local club websites which include a ham radio buy and sell section. The local club swap and shop sites are just that…local sites with limited features catering to the local amateur community. Ham radio buy and sell groups are also found on Facebook and perhaps other social media platforms.

Hamshack is my COVID 'downtime-attempt' at filling the 'gap' created by the cancellation of in-person ham radio buy and sell events, through the development and provision of a ham radio buy and sell website that is extremely easy-to-use. Hamshack incorporates modern web design and effective search and filtering features not found on other buy and sell sites dedicated to ham radio, making Hamshack a great choice for Canadian amateurs wishing to buy and sell ham radio gear. Hamshack has grown significantly with steady increases in registered users, listings, and traffic since its launch on November 1, 2020.

A number of amateur radio club representatives were contacted to exchange website links, in an effort to promote traffic to hamshack and participating sites, after the initial launch of hamshack.ca. It was through this time-consuming process of searching the internet for ham radio club website listings and contacts, that it became apparent a single, accurate and current consolidated listing of Canadian amateur radio organizations doesn't exist on-line

(that I could find). Albeit, many ham radio club directories exist, which include clubs in a specific region. Unfortunately, many are outdated and some contain links pointing to sites that no longer exist. The RAC site also includes approximately 6 pages (30 per page) of Affiliate Clubs. Surely there must be a site listing the several hundred ham radio clubs in Canada… or not? Well, according to the Industry Canada Callsign Database there are approximately 1,500 Clubs listed among the 80,000 assigned callsigns.

Thus, the **Canadian Amateur Radio On-line Listing Project (CAROL)** was hatched! Another COVID project and my attempt to develop a consolidated listing of all active Canadian amateur radio clubs, organizations, groups, entities, etc. But the time and effort to search, locate, seek approval from club representatives to list a site would be an enormous undertaking (even during a lockdown). So how could this be accomplished? CAROL will be developed on a self-enrolment model, where all ham radio groups will be encouraged to sign-up and enter club details using an easy-to-use web 'front-end'. Development of a CAROL demonstration prototype is planned for January 2021, with the design and functional requirements to be determined by a proposed CAROL Working Group to be comprised of amateur radio operators and club representatives from across Canada. It is anticipated that this proof of concept will identify both functional requirements and the data to be displayed in CAROL's amateur radio club listings, which will be rendered in an intuitive and easy to review format. Users will be able to quickly find common data elements such as: club name, location, short description, contact information, and links to other useful amateur radio-related sites.

It is anticipated that additional data will be identified by participants during the demonstration prototype phase of the CAROL Project. In some cases, this data may exist on current amateur radio club websites but is not readily apparent and only determined through a thorough review of the entire website. CAROL is intended to provide a solution by offering easily accessible data in a standardized format for all Canadian amateur radio entities. CAROL will include robust search and filtering tools enabling users to quickly locate specific club information, as well as aggregate data grouped by location, organization type and other attributes to be determined during the CAROL Demonstration Prototype initiative.

Both the hamshack.ca buy and sell site and the CAROL Project were undertaken as my contribution to provide helpful easy-to-use tools to further the promotion of amateur radio in Canada. Please visit hamshack.ca to buy and sell surplus ham radio equipment. Amateur radio operators and club representatives are also encouraged to contact info@carolproject.org if you have questions, comments or want to participate in the Demonstration Prototype phase of the CAROL Project.

Best 73 and continue to stay safe in 2021.

~ VE7DXE Don Rosberg

Editor's Note: You can find Don's site at: www.hamshack.ca. I sold an item of mine on the first day of listing.

Measurements With The NanoVNA

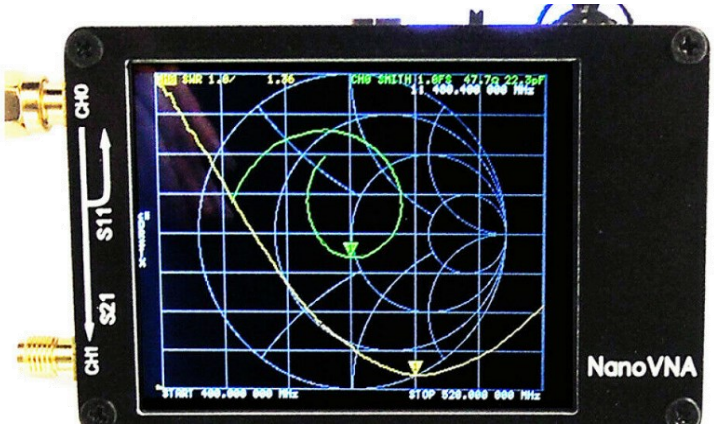
Arie Kleingeld PA3A

Part 1—Measuring the characteristic impedance of a transmission line

As a result of positive feedback arising from Arie's article in the last issue, I contacted him and he has kindly offered to share his entire Nano VNA series with The Communicator. Here is Part 1—Ed.

Preface

The nanoVNA (VNA stands for Vector Network Analyzer) has conquered the amateur world in a short time and will no longer need an introduction to many readers. The device is relatively cheap and accurate enough for the radio amateur. It's a small thing, hence the prefix "nano". Various versions of such a VNA have now been designed and produced, with increasingly better specs.



The VNA I used is the so-called nanoVNA version H3.2. The H stands for Hugen, the nickname of the designer / producer. The 3.2 stands for the print version, which in my case means that it is approximately from the period of October 2019 and has a 2.8 inch screen. For an HF enthusiast like me, the small screen version H3.2 is fine. On the one hand because I never do anything with VHF, let alone on higher frequencies, and that my nanoVNA is always connected to a PC in my shack. For measuring antennas on location (mainly SWR), I still use the 'good-old' MFJ-259B that I paid for in guilders at the time, and it has bounced around my shack for that purpose, but still gives good measurement results.

This article covers: determining the characteristic impedance of a cable, i.e. finding that known 50 ohms of the RG-213 cable or the 75 ohms of RG-59 cable, or just the characteristic impedance of a piece of power cord if you would like to use it as a transmission line. We do this with the nanoVNA, linked to the nanoSAVER program under Windows 10. This makes controlling the nanoVNA and reading the measured values much easier. The graph pictures of the measurement are also taken from this. In addition, I will also use the MFJ-259B analyzer for such a measurement. That too is actually a VNA, albeit more limited than the nanoVNA, but it also works very well.

A brief explanation of the theory regarding this measurement

When taking this measurement, it is nice to keep a few things in mind.

1. Impedance (we will measure that later)

Impedance is a combination of resistance and reactance and is expressed in ohms. We usually write this as Z = R + jX. By way of illustration: Z = 25 + j35, means that we are dealing with a resistance of 25 ohms, in series with a coil with a reactance of 35 ohms (that 'j' indicates the 90 degree phase shift. If there is –j35 we are dealing with a capacitor.

2. Behavior of transmission lines that are open or shorted

A topic that often shows up in the radio amateur exams… open and shorted transmission lines. With certain cable lengths you can then measure impedances at the beginning from almost 0 to almost infinity and everything in between. Known lengths with known properties are, for example, ½ or ¼ wavelength. The nuances can be found in all kinds of books or course material from the DLZA or IWAB.

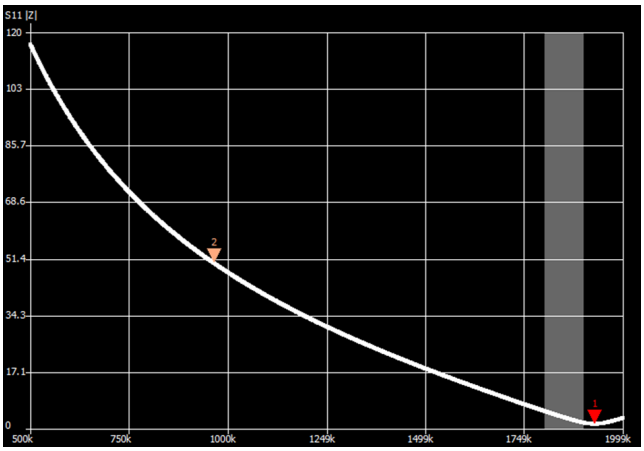
There is also a less known special length. That's the 1/8 wavelength. What it shows is the following: do you short a coax, or do you keep it open at the end, or do you connect a pure resistor of whatever value, and measure the Z = R + jX at the beginning of the cable.

Then the approximate value of the characteristic impedance of the coax cable is equal to | Z | = square root ($R^2 + X^2$). We will use that in the measurements below.

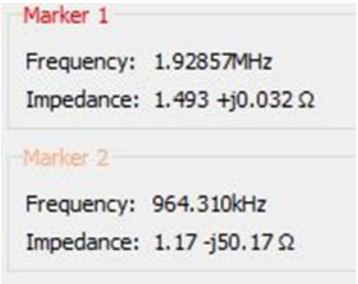
Who said transmission line theory wasn't fun?

The measurement with The NanoVNA.

The nanoVNA is connected to about 25 meters of coax labeled "Belden MRG-213 Eca MIL-C-17". This has to be a very good cable. RG213 has a velocity factor of approximately 0.66 and is known to radio amateurs as 50 ohm cable. The coax is open at the far end (high ohmic) so if we select a frequency where it behaves like a quarter wave, about 25m, then you will see a low ohmic value there. This is shown in the following picture from nanoSAVER.



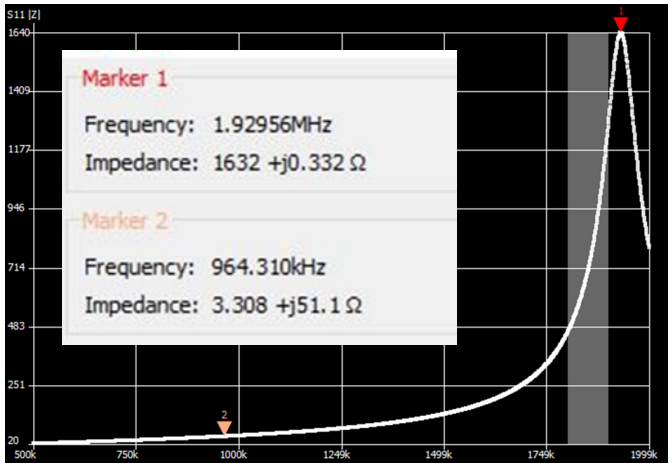
The red marker with no. 1 is at the frequency where the impedance is low/almost zero and practically ohmic (so not inductive or capacitive): 1928 kHz. At this frequency the electrical length of the cable is therefore 1/4 wavelength. So we don't need to know the exact length of the coax, nor the exact velocity factor, it is just ¼ wavelength long for that frequency. If you cut the frequency in half, then for



that frequency the electrical length of the cable would be 1/8 wavelength. That's where the second orange marker is, 964 kHz. We see the | Z | in the graph and read in nanoSAVER for marker 2 close to 50 ohms. | Z | = square root ($R^2 + X^2$).

Since the R is very small compared to the X, you can almost say that the X in value is equal to the characteristic impedance of the cable.

You get a similar picture if you short the same piece of coax at the end.

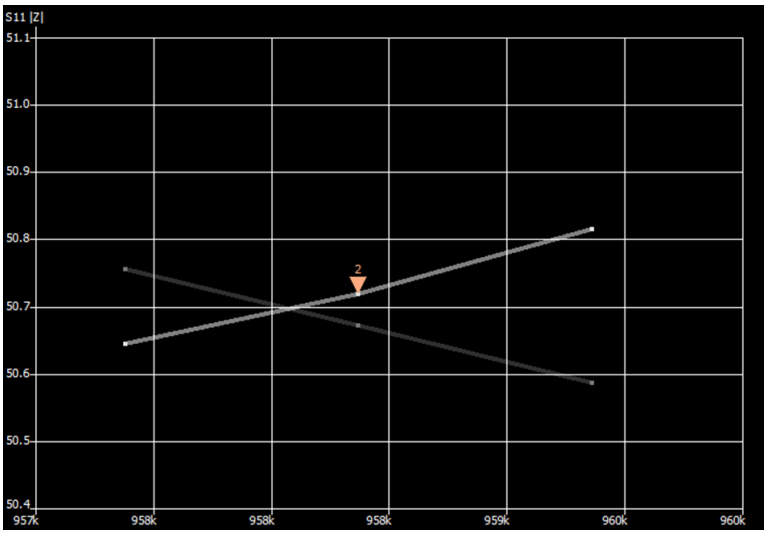


With the exception of one kHz, the high-impedance value is in the same place as the low-impedance value (marker 1). At the frequency for 1/8 wavelength we read at marker 2 that the characteristic impedance of the cable is approximately 51 ohms.

For a device selling for less than 50 euros (Amazon.ca C$77 or US$60), it is not a bad result if you consider that we compared two completely different situations: a short-circuited cable and one that is open.

Incidentally, Belden RG-213 is known to have a true characteristic impedance of: 50.6 - j1.6 ohm, so about the value of the common reference to 50 ohm.

Experts sometimes take both measurements (open and closed line) and take a kind of average of the two measured values. They then superimpose the two graphs and see where the two graphs intersect to read what the value of | Z | is then. Let's do that too.



We now arrive at 50.7 ohms *[above]*. Even rounded, with inaccuracies and neglect, this is almost too good to be true. I would have been happy with a value between 48 and 52 ohms… for my amateur purposes anyway.

Measurement with the MFJ-259B (who doesn't know it)

For the measurement with the MFJ I find a piece of RG-58/U of unknown origin. The length is about 5 meters, and it is shorted. With half a wavelength between we should measure something of low-impedance again (reactance is also zero) and that turns out to be the case at 19,486 kHz. That's about right. Our roughly 5 meters of real length of cable => electrical length is 5 divided by 0.66 = 7.6 meters. A whole wavelength is then 2 x 7.6 = 15.2 meters with a frequency of more than 19.7 MHz.

Now the length of the coax was not really measured exactly, but it looks pretty much like it was accurately estimated.

For measuring at 1/8 wavelength, the frequency must be 4x lower than that for ½ wavelength, so approx. 4.875 kHz. The reading on the MFJ is now: Z = 5 + j53. The characteristic impedance of the cable is then | Z | = square root (25 + 2809) = 53.2 ohms. According to the specs, a Belden RG-58/U would have a characteristic impedance of 53.9 - j2 ohms. Right on target. The MFJ-259B did it again!

In a follow-up article we want to determine the damping of a sheath current choke, and since it is also said on various forums that the impedance of such a choke must be at least 5000 ohms, we will measure whether that is confirmed with our little instrument. So, to be continued…

Source coax data: ac6la.com: TLDetails

TLDetails is an educational and useful program that works with precise formulas to show the behavior of different transmission lines. Heartily recommended.

~Arie Kleingeld, PA3A

QSO Today - Episode 1
Arie Kleingold - PA3A

Arie Kleingold, PA3A, came to the attention of QSO Today because of his DXpeditions, through Mercy Ships—hospital ships, off the coast of Africa.

In this QSO, Arie tells us his ham radio story beginning with his stint in the Merchant Marine to the present.

Listen to the podcast

Ham Hardware

Al Duncan VE3RRD

Making a slingshot launcher

…or how to get that dipole antenna high enough in the tree

Field Day and JOTA for 2007 taught me one thing – a lot of time can be wasted trying to get antenna support ropes up in trees if you don't have the proper tool. I think we spent over an hour twirling a weight on the end of a cord and trying to toss it up over a high tree limb to support one end of a multiband dipole. We never did get it over the limb we wanted and had to settle for a lower one. I ran across a simple slingshot launcher on a webpage by K1DEU and decided to give it a try.

For those of you who want to build something bigger and better, take a look at the compact, high power CSV19 pneumatic launcher at http://www.antennalaunchers.com/csv19/index.html.

Two views of the finished launcher, ready to use *[right]*. The 15lb monofilament line is heavy enough to pull a light weight cord of greater strength back over the tree. This small cord can be used to support some antennas or could be used to pull a stronger rope back over the tree.

All the parts are available from the local Canadian Tire store *[list lower right]*.

Other than the fishing reel (which you may already have) and the slingshot, the only other pricy item is the rubber hose. It must be ¼ inch inside diameter and about ½ inch outside diameter – only a 4 inch length of hose is required.

Assembly only takes about 15 minutes (part of which is getting the packaging open). Pull one end of the wrist support sling off the ¼" steel rod, and slip on a 4 inch length of neoprene hose (takes a little wiggling). Next slip on the two hose clamps (screw facing down or to the right - away from your wrist). Re-install the wrist

75-4772-0	Crossman "Tempest" slingshot	12.99
78-4429-4	Zebco 404LE fishing reel with 15lb line	14.99
78-4970-2	1 ounce RedWolf bell sinkers (pkg of 3)	.99
63-2139-0	7/32 inch stainless hose clamps (2 required)	2.18
78-5067-8	size 8 swivel snap (package of 10)	2.19
23-6010-6	¼ inch neoprene rubber hose (2 ft length)	4.99
	Total cost before taxes	**C$38.33**

support sling, position the reel as shown in the photo and tighten up the hose clamps to hold it in place. Tie on one of the swivels to the 15 pound fishing line, attach a sinker and you're done!

The rounded sinkers are a bit difficult to keep in the leather pocket when getting ready to launch, so I dipped them a couple of times in red "Brush-On Electrical Tape" to make them easy to grip and easier to see up in a tree. You can get Brush-On Electrical Tape at Princess Auto for about $5 for a 118ml (4 fl oz) can. If this product rubs off too easily, I may try heat-shrink tubing over the sinker.

In this picture, the line release button on the rear of the reel had not been pressed, so the line is pulled tight. In actual use, once the line is released, it tends to hang loosely and care must be taken not to snag it prior to firing.

How did it work? On the first test "firing", the weight was released at an upward angle of about 45 degrees and landed in the snow about 150 feet away. The only problem discovered is that the fishing line easily gets tangled in bushes and takes awhile to recover if you have missed your shot at the tree limb.

Update

After several years of using this "slingshot antenna launcher" it has repeatedly proven itself to be most useful. We have been using it every year for field day where we need to set up a G5RV and a Carolina Windom. If I miss the branch I am aiming for, it is fairly easy to remove the weight and wind the fishing line back in to try again.

I picked up a reel of "chalk line" at a discount store and after firing the 1 ounce weight on the 15 pound line over the tree branch and letting the weight pull out fishing line until it drops through the tree branches to be within reach, I remove the weight and connect the chalk line cord. I am then able to wind in the fishing line while pulling this light weight cord back up over the tree. If I am only using a QRP antenna such as an end-fed, then the cord is lots strong enough to pull up the antenna; but if I am setting up a heavier antenna such as a full size G5RV or the Carolina Windom, then I use the chalk line to pull a small rope over the branch and pull up the antenna with the rope.

~ Al VE3RRD

We hope to see more of Al's articles in coming issues of The Communicator. Al is a member of the Barrie (Ontario) Amateur Radio Club. He is the author of the Radio Direction Finding Handbook, a free version of which is available at https://ve3ips.files.wordpress.com/2017/03/rdfing_v3.pdf

~ Al VE3RRD

British Columbia QSO Party 2021

1600z Feb 6 to 0359z Feb 7 AND 1600z to 2359z Feb 7

Objectives:

- **Stations in British Columbia contact other stations in the province as well as the rest of Canada, the United States and beyond.**
- **Stations outside British Columbia make contacts with VE7/VA7 stations.**

- Original photo certificates for top scores in all classes of entry, BC and outside BC (state/province/DX). New photo every year! Collectible!
- Special photo certificates for top score in each federal electoral district. (BC stations only)
- Plaques offered in **10** sponsored categories: Top YL, Top BC single-op, Top BC multi-op, Top US, Top Canada outside BC, Top DX, Top Mixed Mode, Top CW, Most Federal Districts Contacted and Top Club in BC
- BCQP is fully supported by N1MM contest logging software, CQ/X GPS-enabled software for mobile contesting and N3FJP state QSO party logging program.
- Follow links at **http://orcadxcc.org/bcqp.html** for rules, tools, helpful hints, and in-depth event analysis/reports and scores from past years.
- BCQP is included in the State QSO Party Challenge.
  Enter competition by posting BCQP score to 3830scores.com

Questions?
Email BCQP Contest Coordinator, Rebecca VA7BEC at va7bec@rac.ca

Join Orca DXCC in BCQP 2021
It's always a whale of a good time!

VE7SL's Radio Notebook

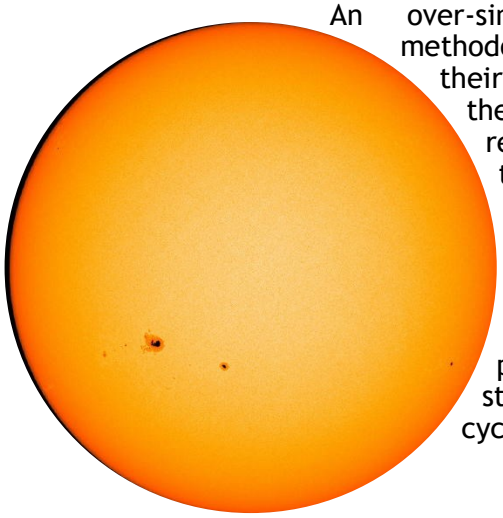
Steve McDonald VE7SL

Solar cycle 25's fast progress

Blog readers may remember my previous blog discussing a more optimistic prognosis for the just-starting solar Cycle 25. It described the then recently-published scientific paper whose conclusion was rather startling:

"... we deduce that Sunspot Cycle 25 could have a magnitude that rivals the top few since records began."

The scientific paper described the exact opposite of any and all predictions that I have read or have seen referenced, and at the time of publication, was surely a bold and risky claim for the paper's authors.[1]



An over-simplification of the methodologies used to develop their prediction describes the study of the complex relationship involving the Sun's 22-year (Hale) magnetic cycle, the end points of adjoining cycles called 'terminations' and sunspot production, to predict the eventual strength of the new cycle.

The end of the cycle or **'terminator'** event plays a significant role in the new cycle's progress, as the shorter the separation between adjoining terminators, the stronger the next cycle will be. The possibilities of Cycle 25 being a truly strong one depends upon (according to the paper) a terminator event occurring sometime before the end of 2020.

Although there has been no official announcement as of yet, it appears that the termination may be presently occuring. Again following the paper, the termination event will produce a sudden and marked upturn in the growth of solar activity and will in fact, switch on suddenly within one solar rotation. As startling as this sounds, it appears to be exactly what is happening on the Sun right now.

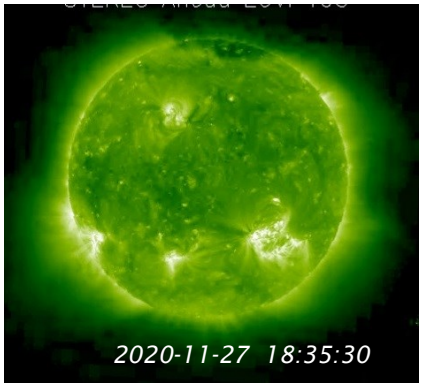


Image courtesy: nasa.gov

Just one week ago, the Sun's solar flux stood at ~79 sfu (Solar Flux Units) but has climbed rapidly to 110. With several active sunspot regions on the earth-facing side of the Sun and several actively flaring groups about to rotate into view on the backside, it seems as if this sudden growth may be sustainable.

What is particularly encouraging is the activity level of the earth-side spots as well as the ones coming around, with several C and B-class flares continuing to push the flux higher.

Although it will likely slow and subside, a key indicator of future strength will be the time that it takes to recover and climb again.

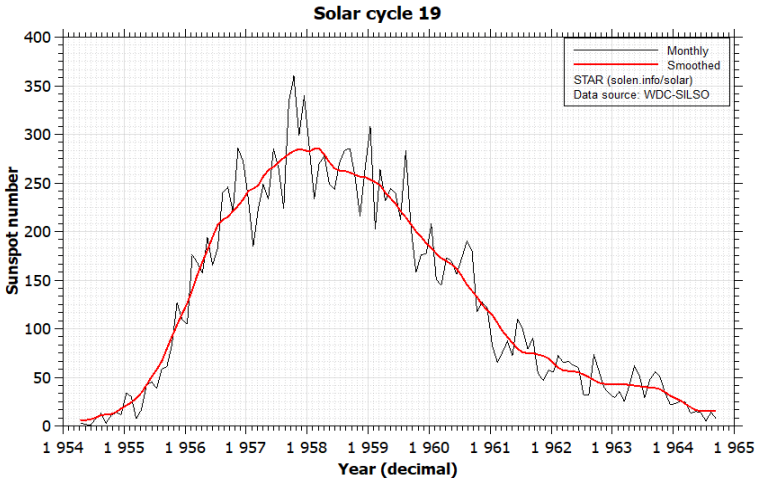
Another interesting gauge of a new cycle's possible future strength is the number of months needed to reach an average monthly SFI of '90'. Strong cycles tend to climb early and rapidly, in order to reach their lofty heights.

The strongest cycle on record was Cycle 19, the grandaddy of them all.

[see image above right, courtesy: http://www.solen.info/solar/]

Compared to anything before or after, it was a magnificent monster of a cycle for ham radio. Cycle 19 reached the magic SFI 90 value in only 18 months… Cycle 25 has reached **this same point in just 12 months!** If this is indeed an accurate marker for cycle strength, and there is no reason to believe otherwise, then maybe we should all hold onto our hats.

We've been told for several years by those who know these things, that Cycle 25 would likely be a repeat of the poorly-performing Cycle 24, or even weaker. I think one thing that can now be reasonably surmised is that this isn't another Cycle 24! We should know shortly, if Cycle 25 is the real thing or not, once the termination event has been confirmed.



In the meantime, enjoy the wide open strong signal opportunities now playing on 10m… the band is back once again and in fine form… way earlier than anyone ever expected!

~ Steve VE7SL

Steve VE7SL's Amateur Radio blog and Twitter feed

Article references

[1] Scott W. McIntosh (1), Sandra C. Chapman (2), Robert J. Leamon (3,4), Ricky Egeland (1), and Nicholas W. Watkins (2,5,6)

[2] National Center for Atmospheric Research, P.O. Box 3000, Boulder, CO 80307, USA.

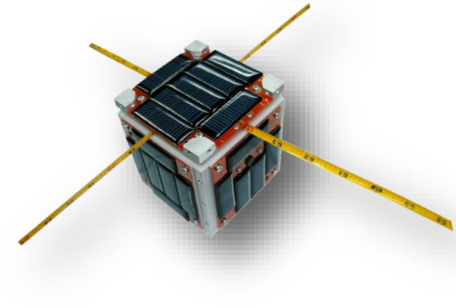
[3] Centre for Fusion, Space and Astrophysics, University of Warwick, Coventry CV4 7AL, UK

[4] University of Maryland, Department of Astronomy, College Park, MD 20742, USA.

[5] NASA Goddard Space Flight Center, Code 672, Greenbelt, MD 20771, USA.

[6] Centre for the Analysis of Time Series, London School of Economics and Political Science, London WC2A 2AZ, UK

[7] School of Engineering and Innovation, STEM Faculty, The Open University, Milton Keynes, UK



Satellite News

Working the ISS new repeater

It's easier than you imagine!

This article is based on a presentation I gave to the SARC Monthly General Meeting via Zoom on December 9, 2020. The slide deck is available at *https://drive.google.com/file/d/1haHWruHdiXkfyfaxGAVV57R05VxmND3L/view?usp=sharing* *and the video at* https://youtu.be/Nl_qtSqqDhw

In the last issue of The Communicator, we reported that a cross band FM amateur radio repeater with a downlink on 437.800 MHz was activated on the International Space Station.

The new radio system is in FM cross band repeater mode using an uplink frequency of 145.990 MHz with an access tone [CTCSS] of 67 Hz and a downlink frequency of 437.800 MHz. Despite the distance, this makes working the ISS repeater almost as easy as working a terrestrial one.

Capabilities of the ISS amateur radio station now include a higher power radio, voice repeater, digital packet radio (APRS) capabilities and a Kenwood VC-H1 slow scan television (SSTV) system.

A Quick Review

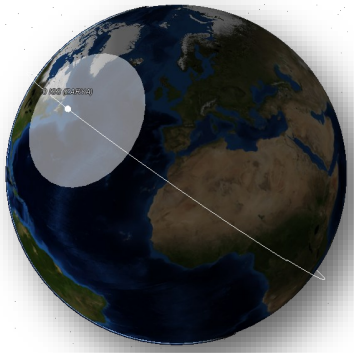
The ISS has been continuously occupied since Nov 2, 2000, staffed primarily by US, and Russian personnel but crew have included astronauts from 19 other countries, including 8 Canadians.

A joint project, the primary mission is as a microgravity and space environment research laboratory.

Low earth orbit satellites (LEOs), which include the ISS, circle the Earth at approximately 2,000 Km (1,200 mi) height or less. The ISS average altitude of 400 kilometres (250 mi) and its size 110m x 100m make it the largest artificial object in space, and the largest satellite in low Earth orbit. It is regularly visible to the naked eye, particularly if you are viewing at night under a clear sky and the ISS happens to be in sunlight. At this height, the ISS orbits every 93 minutes (plus or minus a few seconds) completing 15.5 orbits per day.

ARISS
Amateur Radio on the International Space Station

Its 'footprint' on earth may result in radio distances of 400 – 2,500 Kms (250 - 1,500 miles). Not bad if you're using a hand-held for the FM contact!



The ISS 'Footprint' covers thousands of square kilometres, allowing very distant contacts.

Previously, the voice contacts with the ISS were limited to astronaut contacts. You had to be really lucky or be participating in a scheduled event to succeed. SARC did make a direct contact with astronaut Reid Wiseman KF5LKT using the ISS call N1SS, aboard the ISS during Field Day 2014.

But as of recently, there is a REPEATER aboard the station. This repeater need not be staffed by an astronaut and operates much like a REALLY high repeater here on Earth. The advantage of course is that there are no obstructions to interfere with your or the ISS signal.

Working the ISS

Depending on the orbit, the ISS may approach at different angles. It may be a south-to-north pass (ascending), or north-to-south (descending), so determine whether the pass is towards the east or west of your location. Although it does occur, and is the best, it's rarely directly overhead, and we tend to get two consecutive passes (one to the east, one to the west) timed about 90 minutes apart.

Obviously, the best and longest passes have the highest elevation (passing directly overhead). I have found that passes over 60 degrees above the horizon should work with a handheld transceiver. And lower passes with a directional antenna. Being located as we are in a mountainous area, we often have no choice when passes are below 20 degrees… Mountains get in the way around here on low passes.

The chart *[right]* shows a typical one week schedule. But how do you find charts such as these?

A Typical week of ISS passes at CN89

Date	Visible Period	Max Elevation	Start Direction (Appears)	End Direction (Disappears)
Fri Dec 4, 5:00 PM	6 min	53°	10° above WNW	11° above E
Fri Dec 4, 6:38 PM	2 min	46°	21° above W	46° above SW
Sat Dec 5, 5:50 PM	5 min	71°	12° above WNW	21° above SE
Sat Dec 5, 7:27 PM	< 1 min	11°	11° above WSW	11° above WSW
Sun Dec 6, 5:02 PM	6 min	83°	10° above WNW	10° above ESE
Sun Dec 6, 6:41 PM	2 min	21°	19° above WSW	18° above S
Mon Dec 7, 5:54 PM	3 min	32°	31° above SW	10° above SSE
Tue Dec 8, 5:03 PM	6 min	48°	10° above WNW	11° above SE
Wed Dec 9, 5:56 PM	1 min	13°	13° above SSW	10° above S
Thu Dec 10, 5:08 PM	2 min	21°	21° above SSW	10° above S

Software and Apps

Fortunately there are many choices for free and low cost apps for Windows, Mac, Linux and iOS and Android portable devices. I tend to use my iPad to plot a pass and my app of choice is 'HamSat' although I have three other tracking apps installed. I use my iPad because it is less bulky than my computer and very portable. I use my iPhone as an audio recording device, but more on that later.

If I were using a motorized device for pointing my antenna, I'd be using a computer as computer tracking software includes the required drivers.

What are your software choices? Here are a few…

- On the web: https://spotthestation.nasa.gov/sightings/view.cfm?country=Canada&region=British_Columbia&city=Surrey
- N2YO.com
- On iOS and Android: HamSat, OrbiTrack, TrackSats, etc.
- On Windows: Previsat, Gpredict, SatPC32, Satellite Track
- On Mac: Orbitrack, MacDoppler, GoSatWatch

What do I need?

To work the ISS repeater you can use what you use to access any other VHF or UHF repeater, your stock equipment. If you get a bit fancier your results will be better as you can work lower passes with more air time. But first you'll need to look up the time of the pass and direction using the web, an app or computer software. Then you need:

- At least a receiver capable of tuning to 437.800 MHz in the 70cm UHF band;
- A transmitter capable of 145.990 MHz in the VHF 2-meter band, with a 67 Hz subaudible CTCSS tone on transmit. The tone 'opens up' the ISS transmitter;
- I find that a hand-held mic is preferable to trying to balance a transceiver;
- If you're in a noisy environment, using earbuds or a headset is preferable, to cut down extraneous noise;
- A recording device. This is optional but if you get a good run, you don't want to be stopping to note down callsigns and coordinates. I use the audio recording app on my iPhone.

You do not need high power. Use no more than 10 Watts and I find 5 Watts is generally enough. Remember, there's nothing in the way!

Remember the Doppler effect!

The Doppler Effect

The distance between a satellite transmitting from space and a radio transceiver on the ground changes as the satellite approaches, passes and then moves away. This is comparable to hearing a siren approach, pass by and move away; the sound appears to change. Similarly, as a satellite approaches, the frequency of its transmitter appears to be higher than the actual transmission frequency. Overhead is the time of closest approach when the transmitted frequency and the received frequency are the same. As a satellite moves away, the frequency appears to be lower than the actual transmission frequency.

If you do a lot of serious satellite work, you program your transceiver on 5 memory channels to address the frequency changes resulting from the Doppler effect.

But, if you are just trying this out for fun and are able to work a high pass, you should have several minutes of access even without a Doppler frequency shift. Although a satellite may sound distorted, or you may not hear it at all at the extremes of the pass.

Memory Channel	RX Doppler Offset (kHz)	Uplink Frequency (MHz)	Downlink Frequency (MHz)
AOS M1	+10	145.985 PL 67.0	437.810
RIS M2	+5	145.990 PL 67.0	437.805
TCA M3	0	145.990 PL 67.0	437.800
DES M4	-5	145.990 PL 67.0	437.795
LOS M5	-10	145.995 PL 67.0	437.790

As you can see in the table above, you typically shift the receive frequency by plus or minus 5 KHz steps from the base frequency and program them into your memory channels.

Your transceiver and antenna

I have worked a number of LEO satellites. Some need much greater effort, and better equipment than others. For the ISS repeater, depending on the pass, I have successfully used all of the following:

- Usable for receive only: A receiver, scanner or SDR dongle;
- Better: A dual-band handheld with stock 'rubber duckie' or better antenna. A simple wire counterpoise *[lower right]* will enhance your efforts;
- Best: Dual-band hand-held with a directional antenna or two transceivers, one on VHF and one on UHF;
- Ideal: Dual-band mobile with directional antenna.

The ISS transceiver is a Kenwood D710GA as shown at the start of this article.

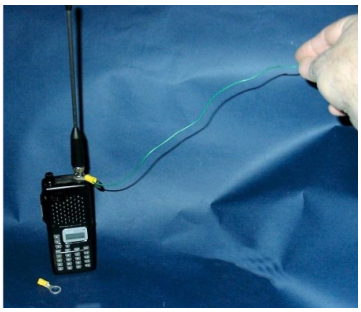
Antennas that work

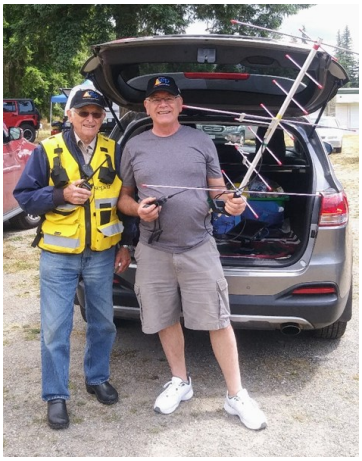
You will get results with these, in order of preference.

- A stock 'rubber-duckie' antenna or better;
- At less than 45° elevation a fixed ¼ wave vertical or magmount antenna.
- A tape measure Yagi. The Internet is full of do-it-yourself plans and we have featured it in previous Communicator newsletters.
- A commercial or DIY antenna like an Arrow, Elk or similar.

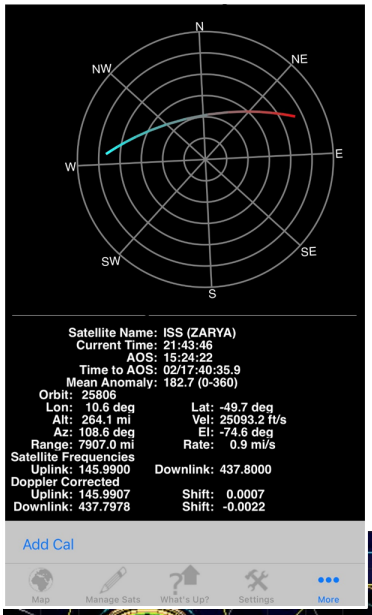
See also 'Cheap LEO Antennas':

http://www.wa5vjb.com/references/Cheap%20Antennas-LEOs.pdf





Antenna choices, from top to bottom, a rubber duckie with optional counterpoise. A'tape-measure' yagi, and an Arrow brand dual-band yagi



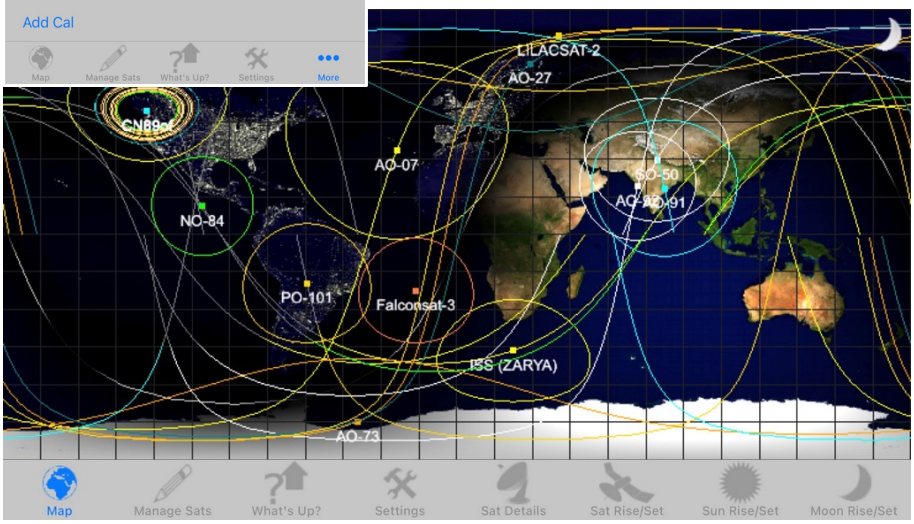
Working with the software

I'll provide a brief explanation of the iOS software app that I use. There are so many packages out there that it is impossible to document them all but the principles are the same.

All the software and apps that I have used update the Two-Line Element set (TLE) file from the Internet on a regular basis. Without going into the complex math involved, a TLE file is a data format encoding a list of orbital elements of an Earth-orbiting object for a given point in time, the epoch. Using suitable prediction formulas, the state (position and velocity) at any point in the past or future can be estimated to some accuracy. Watch the 20th Century Fox movie '[Hidden Figures]' *[above left]* for an example of how this works.

Once your TLE file is downloaded and you have entered your location, you should be set to go.

Below is the first screen I look at. It shows the footprint of the satellites I usually work. Select the satellite you wish to work, for example the ISS by tapping it. The software should provide you with a list of upcoming passes. If you are new to this, pick a nice high pass. It will be easier to work and it will last longer.



The example *[left]* shows the next screen with circles 15 degrees elevation apart. The outer ring is 0 degrees (the horizon) and the center is 90 degrees (straight up). This example shows a pass with a maximum elevation of 60 degrees. The pass starts in the blue, so from the west, and arcs across the sky towards the north at the highest elevation, descending to East-North-East where it dips out of range.

Here are some of the terms you may encounter in your software:

ARM: Sending a CTCSS tone with your transmitted signal to open up the satellite's transmitter.

AOS: Acquisition of signal. The time the satellite comes into view and you may be able to contact it. I rarely work satellites below 20 degrees as a result of our local terrain, besides a 20 degree pass would only last a few minutes.

RIS: Rising, the satellite is rising above the horizon. Adjust your Doppler.

TCA: Time of Closest Approach. This is the time when the satellite is closest to the observer and when Doppler shift is zero. This usually corresponds to the time that the satellite reaches maximum elevation above the horizon.

DES: The satellite is descending towards the horizon… adjust your Doppler again.

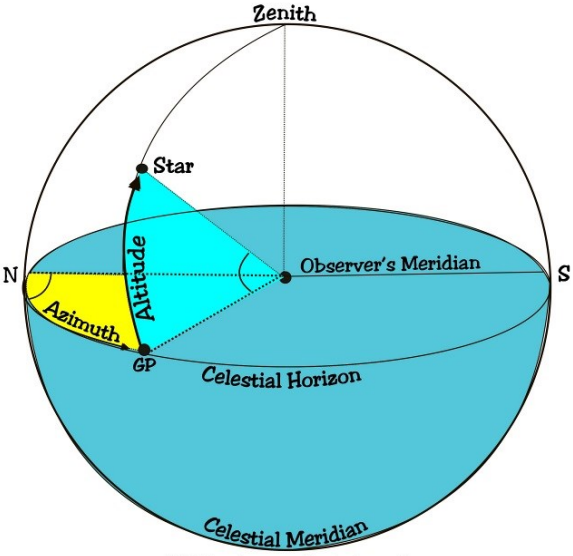
LOS: Loss of signal. The fun has ended for this pass as the satellite has passed below the horizon.

Lon and Lat: Longitude and latitude of the satellite.

Alt: Altitude of the satellite.

Vel: Velocity, the speed of the satellite.

Az: Azimuth is the variation from North (0 degrees) of the satellite. *[see the diagram below].*



Altitude and Azimuth

El: Elevation in degrees. In this example it is minus because the satellite is below the horizon.

Range: How far away it is.

Rate: The speed of the satellite relative to your location.

These above values will update constantly as you monitor.

In this software a dot will appear on the path once the satellite is workable and move along the arc as the satellite traverses the sky.

The ISS repeater is similar to working a terrestrial repeater

You will have to enter at least these frequencies into your transceiver:

Downlink (receive): 437.800 Mhz FM

Uplink (transmit): 145.990 Mhz FM (67 Hz CTCSS tone)

Use additional frequencies if you are compensating for Doppler shift as described earlier.

It is a big offset between receive and transmit (-291.810 MHz) but some transceivers can be programmed for it. I use two channels on my Baofeng UV-5R, one for receive and one for transmit. It lets me monitor receive while permitting transmit on the second frequency. Some use two separate radios, one for transmit and one for receive. I find that I don't have enough fingers to manage two radios at once.

Remember though, low power is adequate.

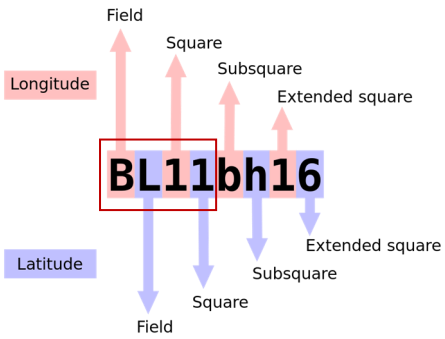
Other than the foregoing, operation is just as for a terrestrial repeater.

If you are operating with a handheld and rubber duckie, you will have to perform some wrist maneuvers as the satellite rises, passes and descends. When it is overhead, rotate your handheld so that the antenna is oriented more horizontal, to send out a better signal in the vertical direction. Toward the horizons bring the antenna more upright, to a vertical position.

Next, send your call and Maidenhead Coordinate…

Your What?

Maidenhead coordinates



The Maidenhead Locator system

The Maidenhead Locator System (a.k.a. QTH Locator and IARU Locator) is a geographic co-ordinate system used by amateur radio operators to succinctly describe their locations.

Its purpose is to be concise, accurate and robust in the face of interference and adverse transmission conditions. The Maidenhead Locator System can describe locations anywhere in the world.

In each pair, the first character encodes longitude and the second character encodes latitude. Dividing the globe into 18 zones of longitude of 20° each, and 18 zones of latitude of 10° each.

Greater Vancouver is at the very NE corner of Charlie-November.

For satellite work we only use the first 4 characters.

You can find a map of the southern Canadian and US grid squares at: https://www.work-sat.com/ewExternalFiles/usgridsq.pdf

What do I say?

Don't be mic shy.

Be prepared for busy airtime during a daylight ISS pass, especially if it is a high pass, the weather is nice and it's during the daytime.

Most hams sleep at night but a contact can be made for us diehard fools who are up at all hours.

Typically I wait so as to not interfere with another station. If the air is clear I say: "VE7TI CN89". This gives my call and locator.

Wait for a confirmation…

If there is no answer, call again. If you hear someone else, answer with your call and locator.

If its not busy… chat. This rarely happens on the ISS repeater. It is so new that there are still lots of hams anxious to use it.

Packet radio and SSTV imaging

Although this article focusses on the ISS repeater you may want to venture a bit deeper.

Although is is not constantly active, the Russian crew members are frequently active sending amateur radio Slow Scan TV (SSTV). Each image takes about 3 minutes to receive. You can access it on 145.800 MHz FM (receive only) but it is very simple. You simply monitor during a pass that lasts at least 3 minutes and hold your receiver to a phone or computer that has the app or software program installed. Line by line the image will appear. You can also make an audio recording and play it back later as long as you do not use any audio compression modes like mp3 or AAC.

Again, there is lots of free software for portable devices, Windows, Mac and Linux but the most common one is probably MMSSTV.

If you have access to a TNC or a transceiver with APRS, packet radio via the ISS may be for you. It too is easy to work and it is always active 145.825 MHz simplex. This site may help: http://www.ariss.net/

ISS crew hours

All astronauts have a ham license. It is one of their back-up communications systems. You've heard it before… "If all else fails".

It is possible to contact the ISS crew members. Depending on their schedule and level of interest they may or not spend their spare time on the station's amateur radios. Some past astronauts have been very active, some not so much.

Crews work on a UTC schedule, usually 06:00Z to 22:00Z UTC time which is 10pm to 2pm Pacific time – they say 4am Pacific time is a good time to try.

Other LEO satellites

Although some of you may not care to try, above right is a list of the other LEO satellites that can be worked with a bit more patience and better antennas.

Further information on these and more can be found from Clint Bradford K6LCS, who has a good website on working satellites:

https://www.work-sat.com/

Patrick Stoddard WD9EWK/VE7EWK also has an informative site. I've talked to Patrick several times and he is very knowledgeable and active: http://www.wd9ewk.net/.

Finally, the ISS repeater is almost always available but it is occasionally turned off. You can check its current status here: https://www.amsat.org/status/ and look for ISS-FM.

- AO-91 Fox-1B ↑435.25 T67Hz ↓145.96
- SO-50 SaudiSat-1C ↑145.85 T67Hz ↓436.795
- CAS-3H LilacSat-2 ↑144.35 ↓437.2
- FalconSAT-3 ↑145.80 ↓435.103
- PO-101 Diwata-2 ↑437.50 T141.3Hz ↓145.9

Other workable satellites

The other ISS frequencies

- 121.125 FM RS EVA from Orlan suit;
- 121.75 FM Downlink from Soyuz-TM (voice). RS EVA from Orlan suit. Soyuz VHF-2. Progress Telemetry;
- 130.167 AM VHF-2 Downlink from Zarya (Service Module). RS EVA to Orlan suits;
- 143.625 FM VHF-1 downlink. Main Russian communications channel. Often active over Moscow. You can hear air to ground conversations in Russian. Sometimes English when US crews talk to their NASA representative in Star City;
- 166.000 AM Soyuz-TM and Progress M-1 telemetry;
- 632.000 634.000 AM Zarya telemetry;
- 628.000 630.000 AM Zvezda telemetry;
- 922.76 CW Soyuz-TM and Progress M1 beacon;
- 2265.0 Digital Telementry Downlink;
- 15003.4 Digital Data downlink.

Good luck

~ John VE7TI

HamShack Hotline

John Schouten VE7TI

Another tool in the emergency communications toolbox

Started in 2018, Hamshack Hotline (HH) is a FREE dedicated Voice over IP (VoIP) telecom service for the Ham Radio community. It is incorporated and not for profit.

You may ask: "Why do we need this?" In an emergency, it is proven time and again that any communications are an asset, and as Amateurs, that's what we do best.

What it is not is radio *[I can hear the groans!]* but nowadays that is not uncommon in our hobby. EchoLink, IRLP and FT-8 type modes all have their detractors. The purists in our community would have you sit in front of a tube receiver and transmitter (separate units of course) and a 1500 Watt amplifier — Now THAT's Ham Radio!

The reality is that the past decade has seen increased merging of technologies and that draws more interest to Amateur Radio.

Typically, phones are established in hamshacks, EOCs, Clubs, ARES, and other Ham related areas and functions. It is not the intention of HH to replace traffic carried over radio in an emergency or other tactical operation, but rather to augment it, by offloading managerial tactical operations and providing a full duplex path for such communications when spectrum is occupied, conditions diminished, or otherwise unavailable.

HH also supports FAXing of information (with appropriate equipment) which allows tactical offices to share documents & data between tactical locations. If you need standard telephone service as well there is capability to make double use of your phone with regular US/Canada VoIP telephone service for C$0.0052 per minute using a provider such as VoIP.ms. If you are an Ooma VoIP phone subscriber there is a connection method as well.

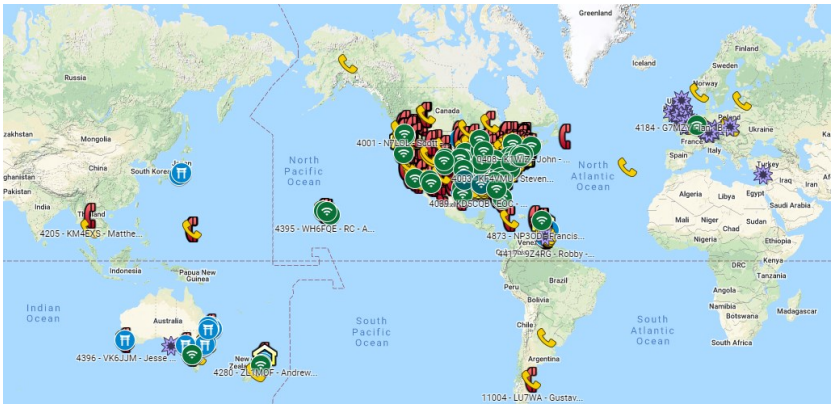
The other exciting feature is the ability to link to digital Amateur Radio modes, permitting your phone to access audio links to many popular networks, AllStar, Brandmeister DMR, D-Star, and CFM.

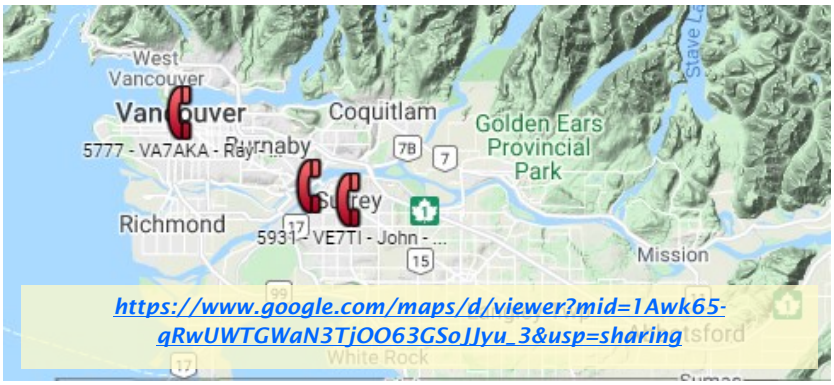
In a non-tactical use, HH is an effective resource for off-air coordination. In addition to all this, conference bridges on the HH network allow large groups of Hams to coordinate & meet in real time anywhere in the world. There are currently four major network hosts:

- US
- Canada (Ontario)
- Europe
- Asia (Hawaii)

These are all trunked together so that the user can access any Amateur on the network. The majority of users are currently in the United States but the numbers are increasing in Western Europe as well. As of this writing, Canada is poorly represented, as is BC, where I'm only one of twelve stations.

A number of Cisco phone models are accepted including the Cisco SPA-504g, SPA-514g, SPA-525, and the Linksys/ Cisco SPA941/942. Other phones can be used on the Network, but must connect to the HHX, and may require more expertise in configuring for service. Assistance is available, but not guaranteed.





https://www.google.com/maps/d/viewer?mid=1Awk65-qRwUWTGWaN3TjOO63GSoJJyu_3&usp=sharing

Listed here, are various documents to answer most questions. While not every case/question might be answered by one of these documents, we encourage you to open a ticket to the HHOPS team if you can't find the answer to your question here. Thank you for your interest in the Hamshack Hotline!

Directory – Now on line! HH will be adding search tools soon!

You Tube Channel

Knowledge Base -all of our documents in one place.

Links to Radio Services

Hamshack Hotline Audio Feeds

Conference Bridge List

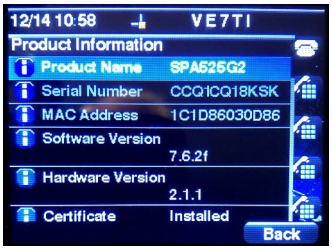
Tri-Fold informational Brouchure

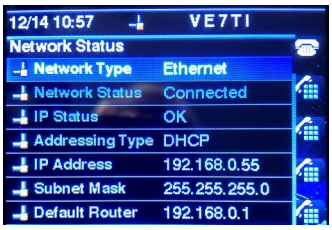
How to get started

Getting on board HH is easy! As long as you are a licensed Amateur, just acquire a supported Session Initiated Protocol (SIP) capable phone or a device called a Cisco SPA-112 which converts a standard telephone for HH use, but without many of the features. Cisco phones are common in office installations and there are a lot of used ones out there. Basically these phones operate by VoIP, each phone has its own unique IP address much like a computer. You are assigned a 'telephone number' by HH that is associated with the MAC address of your device. Each device has a unique MAC address.

The most commonly used phone out there appears to be from Cisco. Their models, dating back about 10 years, are most easily set up on the HH network. I managed to purchase a 4-line phone from Craigslist for C$20 and a colour model for C$50 but there were lots of listings for various models. The only other stipulation is that they are not locked to a provider. Like cel phones, some providers lock phones to their system. The fellow who sold me my phone had used it on his own system and said it had never been locked. Other than plugging it into a network and using the phone menu to reset it, there may not be an easy method to ensure it is clear and ready to program.

Finding the MAC and IP address of your phone is simple using the internal display settings.



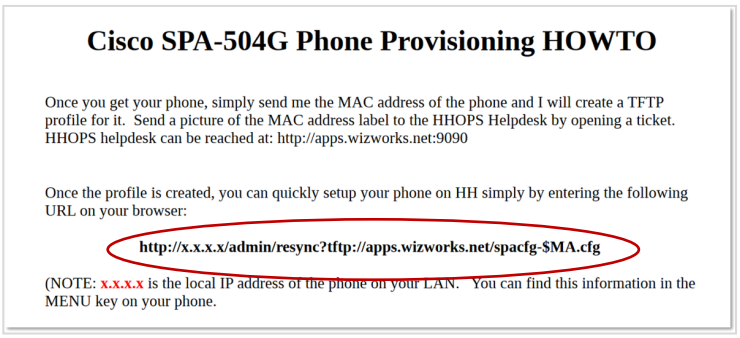


These phones are very configurable via your web browser. After you plug it into your router, the unit automatically acquires a network IP address, like your other home network devices. You can easily access the phone's menu and find the device IP address under "Network". Once in your browser, type in that address (for example 192.168.1.55) the browser will find the phone on your network and it will open a multi-page configuration menu *[photo lower left]*.

I was astounded by the configurability of the phone. I was able to set my callsign on the display, enter memory presets assigned to the four line buttons, and set a background picture. You can program line buttons to flash instead or in addition to ringing and there are so many settings that it will take some study and experimentation to fully customize… but that is not a necessary step. You can keep it simple.

Once you have your phone, you send the phone model number, MAC address, your location and your callsign to the HH team using the website form opening a support ticket. They say registration takes 24-48 hours but I had a reply and a configuration string in only a couple of hours.

Programming, or 'provisioning' as its referred to on the site, is also simple. Once you receive the configuration string you go back to your web browser and place the string in the address bar *[see the graphic below]*. That connects the phone to the HH server and programs it with a unique configuration file for your number.



Cisco SPA-504G Phone Provisioning HOWTO

Once you get your phone, simply send me the MAC address of the phone and I will create a TFTP profile for it. Send a picture of the MAC address label to the HHOPS Helpdesk by opening a ticket. HHOPS helpdesk can be reached at: http://apps.wizworks.net:9090

Once the profile is created, you can quickly setup your phone on HH simply by entering the following URL on your browser:

http://x.x.x.x/admin/resync?tftp://apps.wizworks.net/spacfg-$MA.cfg

(NOTE: x.x.x.x is the local IP address of the phone on your LAN. You can find this information in the MENU key on your phone.

My first attempt to program was a failure but that turned out to be the inadvertent exchange of an 'O' instead of a '0' in the MAC address. Once the right numbers were submitted it only took one try.

The phone rebooted and came up with my callsign on the display. I've used several of the links to talkgroups, including DMR. It seems to work fine. The voice quality is very clear and I can put it on speaker for hands-free use.

We have an existing system in our province called BC-Wide Area Radio Network (BC-WARN) https://www.bcwarn.net/?q=node/11. BCWARN is an association of amateur radio groups sharing the common goal of building a high-speed data network, capable of operating independent of commercial "internet" providers.

One of the goals of BCWARN participating groups is to assist in connecting Emergency Operations assets (EOC's, PEP HQ's, reception centers, etc) together with a common, independent network.

The BCWARN network allows its users to exchange information between the connected sites such as email, internet-chat, remote printing, VoIP telephone and fax calls, and virtually anything else that you would use the "internet" for, but without having to rely on commercial network infrastructure.

Note however, that during the majority of the time, there are gateways to the "internet" that allow traffic from BCWARN sites to communicate all over the world. However, should a major incident cause those gateways to fail, the BCWARN sites will still be able to communicate with each other and exchange their information.

Its operating principles appear similar and it would be interesting to see if the telephone systems can be linked. In the US several groups have already interfaced HH with Broadband-Hamnet, so-called mesh networks https://youtu.be/pCisECfZOak.

Broadband-Hamnet is a high speed, self discovering, self configuring, fault tolerant, wireless computer network that can run for days from a fully charged car battery, or indefinitely with the addition of a modest solar array or other supplemental power source. The focus is on emergency communications. Amateur radio spectrum is used for this purpose. See http://www.broadband-hamnet.org/ and https://www.jeffreykopcak.com/tag/hamshack-hotline/ for more information.

If you have any questions, the FAQ's in the knowledge base area on the web help desk may help, if not – you're invited to open a ticket on the help desk.

There are sone good YouTube videos out there, especially those done by Matthew K0LWC:

Hamshack Hotline: The "Bat Phone" for Ham Radio Operators!

https://www.youtube.com/watch?v=dMr9a_6CuNE

Hamshack Hotline: How To Setup Your Phone And More!

https://www.youtube.com/watch?v=-XRUnnjTugQ and https://www.facebook.com/groups/hamshack/permalink/2782508081965259/

The HH Home page and Facebook group where you will find more information, a directory of contacts, special groups, the help desk, phone and provisioning information.

https://hamshack hotline.com

https://www.facebook.com/groups/hamshack

Our meeting presentation slide deck is at https://drive.google.com/file/d/1sM0alJyKC7TLiRR7wbBjfU_KSKlSqUli/view?usp=sharing

Hopefully this article will stir a few more local hams and get them on the system… It's kind of lonely out here.

~ John VE7TI
HH #5931

Ham Leftovers...

Operating Amateur Radio satellites from your home station

Sean Kutzko, KX9X, demonstrates how you can successfully operate amateur satellites from a basic home station without all the bells and whistles.

Watch Operating Amateur Radio Satellites from Your Home Station: https://youtu.be/tKZ_qCfGn5A

If you are interested in **repeater lists for BC**, http://www.bcarcc.org has repeater lists by frequency and location. But you can now download frequency lists, for BC and everywhere else, directly to your rig's memories using Chirp files. This video will tell you how: https://youtu.be/Uhrw4x4PYJc

Recently, the **North American DX Club**, IRCA released to the public more than 900 past articles from their publication, DX Monitor.

Since 1964, the International Radio Club of America has been documenting medium wave DXing and DXers' efforts to improve their understanding of radio reception and to develop better listening techniques. During that time, over 900 articles have been written, that have furthered the art of DXing.

Many of these continue to be relevant to the more general radio hobbyist, including articles about antennas, radio propagation, receivers and accessories, plus general technical information.

Previously, those articles were available only to club members, but they are now available to all. Go to https://youtu.be/Uhrw4x4PYJc to download your own copies.

Introduction to Raspberry Pi for Ham Radio https://youtu.be/wzkDxKkjRXQ

- Raspberry Pi Build for Ham Radio Part 1 Step by Step https://youtu.be/ZhnCvi54zwU
- Raspberry Pi Build for Ham Radio Part 2 Step by Step https://youtu.be/Bwo782dvQng
- Raspberry Pi Build for Ham Radio Part 3 Step by Step https://youtu.be/kYwh3kn_GIc

"I am often asked how radio works. Well, you see, wire telegraphy is like a very long cat. You yank his tail in New York and he meows in Los Angeles. Do you understand this? Now, radio is exactly the same, except that there is no cat." - *Albert Einstein*

RAC Update:

Canada Day Contest Results

Canada Day Contest 2020 Report

With Canada Day falling on a Wednesday this year and the COVID-19 pandemic having an impact worldwide, it was gratifying to see so many still able to participate in the RAC Canada Day Contest.

While not being a holiday outside of Canada we thank those that took the time to join us in the celebration and exchanging greetings.

With over 735 participants it was the one of the best ever turnouts in recent years despite the ongoing poor solar conditions and resulting propagation.

Our thanks to all those who participated and we hope you all have been staying as safe as possible during this very trying time. With that bit of introduction, on with the detailed results!

As always, you can find all the contest rules and entry forms at:

http://wp.rac.ca/contesting-results/

MULTI OPERATOR MULTIPLE TRANSMITTER (MOMT) VE7IO, VE7TI, VE7WJ, VA7NF & VE7FO working VE7RAC 367,714 points, 523 QSOs

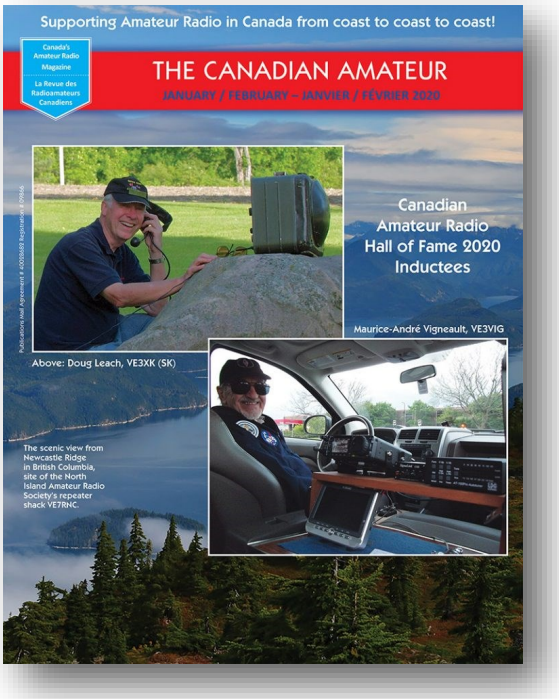
Other high scores:

WD6T 728,928; KD5DD 501,542; VA2RAC 330,162; KA6BIM 312,388; VE5RAC 247,690

~ RAC Contest Managers
Bart Ritchie, VE5CPU and
Sam Ferris, VE5SF

The electronic (eTCA) version of the January-February 2021 issue of *The Canadian Amateur* (TCA) magazine is now available for viewing or download.

To download your copy please make sure you are logged into the RAC website and then visit: https://www.rac.ca/digitaltca/



KB6NU's Column

Dan Romanchik, KB6NU

How to run a multi-station special event

Here's a guest post from Dr. Michael K. Gauthier, K6ICS. I like operating special event stations, both as an "activator" and as a chaser. I hope you find these tips useful... Dan

It's always fun to work a special event where there is more than one call sign or, the same call sign on several bands, required to receive an award. For the award seeker, this brings out the excitement of the chase. But many times, this excitement turns to frustration and disgust when it is found that all the required contacts are not reasonably available or even worse, they are not even on the air. Having been a ham since 1954, I have participated in many special events as both the award seeker and as the event operator. I have seen these problems too many times. Fighting unexpected mishaps, band conditions, QSB, QRN, and QRM is normal. Not having the special event stations working at their best is tragic.

When he's not trying to figure out which way current flows, Dan blogs about amateur radio at KB6NU.com, teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com.

The Problem

As an example of the problem, there are 5 stations to contact, over a 10-day period. You have worked 3 and realize that the other 2 you have not heard. Checking DX Summit and other spotting web sites you find that the 4th station you need has been on 160 meter SSB and 80 meter FT8 for about 4 hours over the past 4-days. When you check out the 5th station, you find no record of them even being on the air.

RATS! That makes you feel good. What a waste of time.

Pre-Event Analysis

- Do you have an event e-mail contact? Review e-mails several times a day, minimum.
- Do you have a website? Does it contain ALL special event information?
- Review the rules and regulations of your event and award(s).
- What is the time period over which the special event will take place? Does it conflict with other events?

- Planning the bands, modes, and times which will be best for the maximum number of contestants.
- When event stations operators can only operate limited times or bands. Add additional station(s) to cover open bands, modes, and times.
- Do you have backup operators?
- Emergencies: Power failures, equipment failures, operator illness, and other problems.
- After the event starts you need to fine tune your analysis, based on current operating conditions.
- Post-event QSLs and Award Certificates. Logging and reporting contacts. QSLs, Awards processing, and Delivery. ""Not in Log" and other problems.

Recommendations

- Use the "most active" bands: 80 Night, 40 Night/Day, 20 Day. Other bands as open.
- Multiple stations using the same call on different bands and modes, at the same time.
- Use all bands/modes, unless it is a single band/mode event.
- Publish typical operating schedule so the stations can be more easily found.
- Suggest award seekers list contacts on DX Summit and other spotting sites.
- Process all QSLs and award certificates rapidly.
- KISS – Keep it Simple Stupid.

Notes

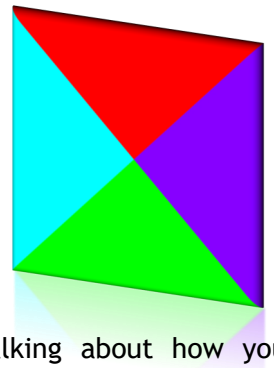
Be aware of band limits for all operators. Novices and Technicians are limited to CW only on a portion of 80, 40, and 15 meters. On 10 meters they do have CW, Digital, and SSB, but only a small portion of the band. General and Advanced classes have their own operating limits. Other countries have their own band limits.

This vehicle is said to have belonged to a woman who parked in the shade while her husband ran in the Ham Radio store to pick up a few things.

Foundations Of Amateur Radio

Onno Benschop VK6FLAB

When will it ever end?



Mark Twain is often misquoted in relation to reports about his death, pithy as always, he said: "The report of my death was an exaggeration." Similarly the death of amateur radio has been reported on many different occasions.

Letting amateurs near a Morse key, banning spark-gap transmitters, introducing transistors, integrated circuits, computers, the internet, software defined radio, the list grows as technology evolves. I can imagine our descendants decrying the death of amateur radio with the commodification of quantum computing at some point in the future of humanity.

Yesterday I had an entertaining and instructional play date with a fellow amateur. We discussed countless aspects of our hobby, things like how you'd go about direction finding if you had access to multiple radios and antennas, what characteristics that might have, what you'd need in the way of mathematics, how you'd write software to solve the problem and how you'd go about calibrating such a system. Could you use a local AM broadcast station as a calibration source, or do you need to generate a known signal?

We started talking about how you'd send data across the network so you could have a dozen devices in different locations that you could synchronize and share data. How would you control it, how would you make use of existing standards, were there other tools like this already and what were their limitations.

Then there was the conversation about using spectrum effectively, seeing current digital modes like FT8 and their level of effective use of a 2.5kHz slice of spectrum with 15 second time-slots and the theoretical bandwidth that you might achieve if you used that mode as a data transmission mode.

There was the conversation around how you'd use propagation tools to determine path openings on the higher bands without needing a beacon, just a computer and a radio.

Then we talked about how you'd go about making a simple WSPR beacon, based on a minimum component count and some readily available hardware, rather than a sophisticated transceiver like a PlutoSDR.

To listen to the podcast, visit the website: http://podcasts.vk6flab.com/. You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here: https://podcasts.vk6flab.com/about/help

There was a discussion around E-class amplifiers and their characteristics and potential pitfalls.

We managed to cover a fair bit of ground in a few hours over our hot beverage of choice, a nice meal for lunch and despite me tripping over the threshold of my front door, banging my head against the wall and rolling my ankle. The head is fine, the ankle not so much.

My point is that the world of amateur radio is never done, it's never finished, there's never an end. There's always more to discover, more to explore, build and investigate.

How on earth could you contemplate that this was a hobby that had no relevance in the world today, let alone that of tomorrow.

I for one am very happy to call myself an amateur and looking forward to discovering what else there is to play with. Why are you an amateur and does this feel like the end or a new beginning every day?

The reports of the death of amateur radio was an exaggeration.

~ I'm Onno VK6FLAB

If you want to do HF in an apartment, where do you start?

One of the many vexing issues associated with getting on-air and making noise is actually making that happen.

So, let's look at a completely restricted environment. An apartment building, seven stories off the ground, no ability to make holes, an unsympathetic council, restrictive local home owners association, et cetera, et cetera.

On the face of it your amateur radio hobby is doomed from the start.

In reality, it's only just beginning.

So, to hear HF right now, today, you can go online and listen to a plethora of web-based software defined radios. There's the canonical WebSDR in Twente and a whole host of others using the same or similar software. There's KiwiSDR, AirSpy, Global Tuners, and many more.

This will give you countless radios to play with, coverage across the globe, the ability to compare signals from different receivers at the same time on the same frequency, the ability to decode digital modes, find propagation, learn about how contests are done, the sky's the limit. I'll add that you don't need an amateur license for many of these resources, so if you're considering becoming part of the community of radio amateurs, this is a great way to dip your toe in the water. Think of it as a short-wave listening experience on steroids.

I hear you say, but that's not amateur radio.

To that I say, actually, it is. It's everything except a physical antenna at your shack or the ability to transmit.

Permit me a digression to the higher bands. If you want to listen to local repeaters on UHF and VHF, listen to DMR and Brandmeister, you'll find plenty of online resources as well. You can often use a hand-held radio to connect to a local repeater which can get you onto the global Echolink, IRLP and AllStar networks. Failing that, there's phone apps to make that connection instead.

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: http://amazon.com/author/owh. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: @vk6flab or check the website for more: http://vk6flab.com/

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6flab.com/, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: https://www.facebook.com/groups/foundations.itmaze

This podcast episode was produced by Onno (VK6FLAB). You can find more at http://vk6flab.com/

Of course if you want to expand your repertoire to transmission, beyond a hand-held, you can.

There are online transmitters as well. Many clubs have their club station available for amateurs to use remotely using a tool like Remote Hams. You'll get access to a radio that's able to transmit and you'll be able to make contacts, even do digital modes and contests. You will require an amateur license and access to such a station. Some clubs will require that you pay towards the running of such a service and often you'll need to be a member.

Then there's actually going to the club, you know, physically, going to the club shack and twiddling physical knobs, though for plenty of clubs that's now also a computer since they're adopting software defined radios just like the rest of the community is. Using a radio via a computer can be achieved directly in the shack, but there's no reason to stay on-site. You can often use these radios from the comfort of your own shack.

If you do want to get physical with your own gear, receiving is pretty simple. A radio with a wire attached to it will get you listening to the local environment. I have for example a Raspberry Pi connected to an RTL-SDR dongle that's connected to a wire antenna in my shack. It's listening across the bands 24/7 and reporting on what it hears.

If you want to use an actual transceiver and you don't have the ability to set-up an antenna, kit out your car and go mobile. Failing that, make a go-kit with batteries, which as an aside will stand you in good stead during an emergency. Take your go-kit camping, or climbing, or hiking. Plenty of opportunities to get on-air and make noise.

I hear you asking, what about having an antenna farm?

Well, you can set one up in a farmers paddock and connect to it remotely - you will need permission from the land-owner - there's plenty of amateurs who use their country abode as a remote station.

If you want to make noise at your actual shack, the antenna might be a piece of wire hanging from the balcony after dark, or an antenna clamped to the railing. You can use a magnetic loop inside your house. Some enterprising amateurs have tuned up the gutters in their building, or made a flagpole vertical, or laid a coax antenna on the roof. Have a look for stealth antennas, there's a hundred years of amateurs facing the same problem.

My own station is very minimalist. There's literally a vertical antenna clamped to the steel patio. Using that I'm working the world with 5 Watts, 14,000 km on 10m, no kidding.

Getting on-air and making noise doesn't have to start and finish with a Yagi on a tower. There's plenty of other opportunities to be an active amateur.

~ I'm Onno VK6FLAB

No-Ham Recipes

Diana Van Der Zande
VE7XYL

Three hour buns

Nothing is quite so welcoming as the smell of freshly baked buns, especially on a crisp, winter afternoon. Does it make you want to sit down, butter a warm bun and savour it? And maybe have another one?

Always keep the dough away from drafts while it is rising. Most people think you have to leave it in a warm place; but this isn't so. By leaving it in a cool place, the yeast takes longer to rise the dough, but it has more time to develop subtle flavours. However, if you are rushed, the oven is an excellent place for rising dough. Preheat oven at 175F (80C or a very slow oven) for 5 minutes. Turn off heat; place covered dough in warm oven to rise. The rising time decreases by almost one-third.

Diana comments, "I use the bread attachment on my mixer. it works well and there is only one bowl to clean! Try using 1/2 white flour and 1/2 whole wheat flour and molasses instead of the sugar".

- 3 cups (750 ml) warm water
- 6 tablespoons (90 ml) granulated sugar
- 2 eggs
- 6 tablespoons vegetable oil
- 2 teaspoons (10 ml) salt
- 7 to 8 cups (1750 ml to 2000 ml) all-purpose flour
- 2 tablespoons (30 ml) quick-rising bread yeast

Preheat oven to 350F (180C or a very moderate oven). Mix together, warm water, granulated sugar, eggs and oil. Add 4 cups of flour and 2 tablespoons of yeast, and then mix well. Add the remaining flour and the salt.

Knead dough, and then place it in an oiled bowl. Cover bowl with a moist tea towel and let the dough rise until doubled in size.

Note: If using a hook attachment on your mixer beat until dough is smooth, soft and does not stick to your fingers when squeezed — about 5 minutes.

Oil your hands, and make the dough into buns of about 2 /4‘ ounces (63 g) each, or whatever size you prefer. Place dough on a greased or parchment covered baking sheet, covered by a moist tea towel, and let the buns rise again in a warm place for about 10 minutes.

Bake until buns are a deep golden brown, rotating pan once during baking, about 20 minutes.

Remove from oven, and transfer to a wire rack to cool.

Back to Basics

John Schouten VE7TI

From The Canadian Basic Question Bank

Antenna traps

One of the antenna examples we demonstrate in class is the multi-band dipole and Yagi antennas that use traps to permit multiple frequency bands on one antenna element. It is a concept that can produce the 'deer in the headlights' look, so we'll describe it in some detail in this Back to Basics.

In the Canadian Basic Question Bank there are several questions mentioning traps:

A typical antenna trap with the cover removed

B-6-8-10 One solution to multiband operation with a shortened radiator is the "trap dipole" or trap vertical. These "traps" are actually:

A. large wire-wound resistors

B. coils wrapped around a ferrite rod

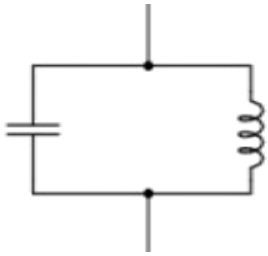
C. hollow metal cans

D. a coil and capacitor in parallel

Amateur radio antennas that operate at several frequency bands which are widely separated from each other may connect elements resonant at those different frequencies.

First, lets review resonance.

An inductive-capacitive (LC) circuit, oscillating at its resonant frequency, can store electrical energy. A capacitor stores energy in the electric field between its plates, depending on the voltage across it, and an inductor stores energy in its magnetic field, depending on the current through it.



If an inductor is connected across a charged capacitor, the voltage across the capacitor will drive a current through the inductor, building up a magnetic field around it. The voltage across the capacitor falls to zero as the charge is used up by the current flow. At this point, the energy stored in the coil's magnetic field induces a voltage across the coil, because inductors oppose changes in current. This induced voltage causes a current to begin to recharge the capacitor with a voltage of opposite polarity to its original charge. Due to Faraday's law, the Electro-motive Force (EMF)

which drives the current is caused by a decrease in the magnetic field, thus the energy required to charge the capacitor is extracted from the magnetic field. When the magnetic field is completely dissipated the current will stop and the charge will again be stored in the capacitor, with the opposite polarity as before. Then the cycle will begin again, with the current flowing in the opposite direction through the inductor.

The charge flows back and forth between the plates of the capacitor, through the inductor. The energy oscillates back and forth between the capacitor and the inductor until (if not replenished from an external circuit) internal resistance makes the oscillations die out. The tuned circuit's action, known mathematically as a harmonic oscillator, is similar to a pendulum swinging back and forth, or water sloshing back and forth in a tank; for this reason the circuit is also called a tank circuit. The natural frequency (that is, the frequency at which it will oscillate when isolated from any other system, as described above) is determined by the capacitance and inductance values.

Resonance occurs when an LC circuit is at a frequency at which the inductive and capacitive reactances (like AC resistance) are equal in magnitude. The frequency at which this equality holds for the particular circuit is called the resonant frequency. A parallel resonant circuit the **maximum impedance** at the resonant frequency. Maximum impedance (AC related resistance) means **minimum current** flow.

This provides a segue into a resonance question...

B-5-12-2 Parallel tuned circuits offer:

A. an impedance equal to resistance of the circuit

B. high impedance at resonance

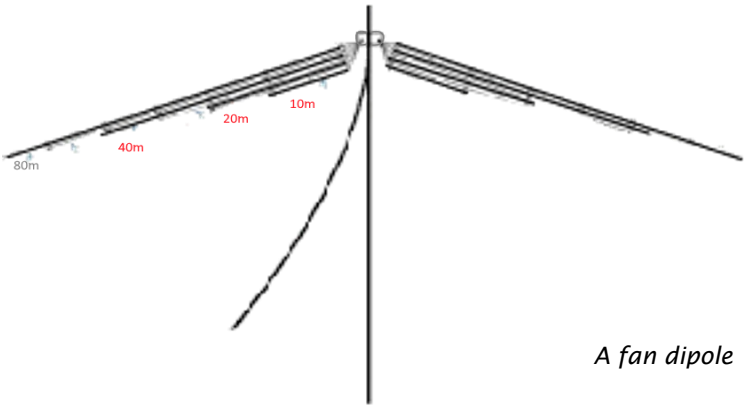
C. low impedance at resonance

D. zero impedance at resonance

It is the one frequency at which Inductive Reactance cancels Capacitive Reactance. In a *parallel* circuit, Impedance (Z) at resonance is *high* (in a series circuit it will be the opposite). As a memory aid, try to visualize the *parallel* circuit as a tub or tank, signals get trapped at resonance. Try to visualize the *series* circuit as a slim tube, signals slip right through at resonance.

But, back to traps…

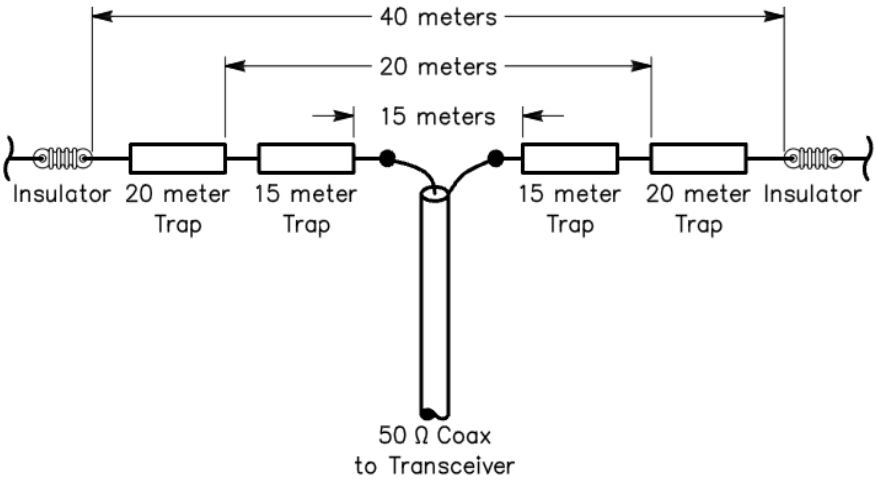
Amateur radio antennas often operate at several frequency bands which are widely separated from each other may connect elements resonant at those different frequencies in parallel. These are often referred to as ‘fan’ dipoles.



A fan dipole

Most of the transmitter's power will flow into the resonant element while the others present a high impedance.

Another solution uses traps, parallel resonant circuits which are strategically placed in breaks created in long antenna elements. When used at the trap's particular resonant frequency the trap presents a very high impedance (parallel resonance) effectively truncating the element at the location of the trap; if positioned correctly, the truncated element makes a proper resonant antenna at the trap frequency. At substantially higher or lower frequencies the trap allows the full length of the broken element to be employed, but with a resonant frequency shifted by the net reactance added by the trap.



The reason why antenna traps (parallel resonant circuits) are useful is to permit operation on more than one band from the same physical antenna. Through their high impedance at resonance, traps shorten the antenna by making the antenna sections beyond them inaccessible.

Maximum impedance (AC related resistance) means minimum current flow. So, "**Antenna traps" are parallel resonant circuits which exhibit high impedance at resonance.** Electrically speaking, they cut-off the antenna element at the trap position when operated at the resonant frequency of the trap.

A typical home-made trap

The disadvantage?

An antenna with traps is a multi-band antenna (i.e., resonant at more than one frequency). If the transmitter leaks harmonic energy (multiples of the operating frequency), this harmonic energy may be more readily radiated by a multi-band antenna. For example, traps are inserted in an antenna for 80 metres to permit operation on 40 metres; if your transmitter puts out 'harmonics' while you operate on 80 m (say, 3.5 MHz), the second harmonic falls in the 40 m band. The antenna is also resonant at that frequency and would freely radiate the harmonics.

There is a YouTube video that helps to explain trapped antennas at:

https://youtu.be/nbgEZbQYpCQ?t=151

So, the answer to our sample question:

B-6-8-10 One solution to multiband operation with a shortened radiator is the "trap dipole" or trap vertical. These "traps" are actually:

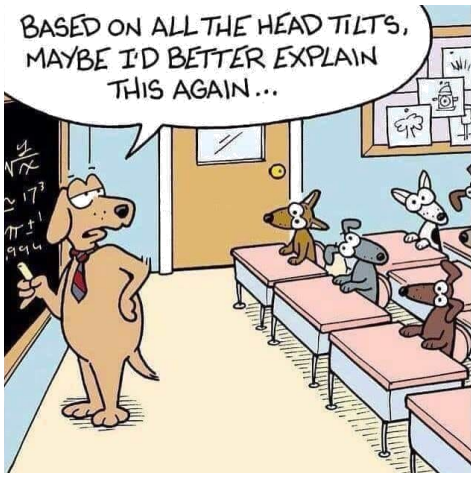
A. large wire-wound resistors

B. coils wrapped around a ferrite rod

C. hollow metal cans

D. a coil and capacitor in parallel

~ John VE7TI



Depending on COVID and logistics, we anticipate offering both of the following Basic Course formats:

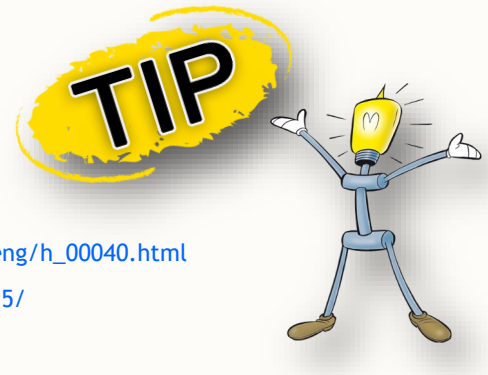
Monday evening: We run the class on-line by pre-recorded video, following the provided manual, with the ability to answer questions and offer further explanations as we go.

On **Tuesday evening**, COVID permitting, we present live in class, record it, then make it available to you later that week on-line.

You may choose one or both above options. The on-line site we use is called CANVAS. It is used by universities and is rated among the highest in terms of reliability, ease of use, and security. It requires no special software installation and may be accessed by a variety of web browsers on any Internet-capable device with any operating system. There are also iOS and Android CANVAS apps.

Study Links for more information

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:



1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. http://tinyurl.com/CanadaBasicQB
2. Industry Canada (ISED) on-line practice page: https://apc-cap.ic.gc.ca/pls/apc_anon/apeg_practice.practice_form
3. The Amateur Radio Exam Generator is at: https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html
4. The ExHaminer Study software for Windows is at: https://wp.rac.ca/exhaminer-v2-5/
5. VE3YT has an excellent question-based guide available at ve3yt.com
6. There are plenty of good resources for both basic and advanced exam study courtesy of the Cold Lake Amateur Radio Society at: http://www.clares.ca/va6hal%20training.html

Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year's free SARC membership!

Newly Licensed? When you receive your paper license in the mail, it will come with a form that can be filled out and mailed to the Radio Amateurs of Canada office, at which point an introductory RAC one-year membership will be set up. Introductory memberships are identical to our existing basic memberships and you will receive The Canadian Amateur magazine for one year.

January 2021

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	For details on all SARC events, go to ve7sar.net				1 ***Happy 2021!***	2 7:30-9:30 AM SARC Social: Kalmar Family Restaurant 8076 King George Blvd, Surrey, BC CONTEST: ARRL RTTY Roundup
3 CONTEST: ARRL RTTY Roundup	4	5 **1930 SEPAR Net** **2000 SARC Net**	6	7	8	9 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: NA QP CW
10 CONTEST: NA QP CW	11	12 **1930 SEPAR Net** **2000 SARC Net**	13 **1900 SARC General Meeting** **[TBA]**	14	15	16 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: NA QP SSB
17 CONTEST: NA QP SSB	18 **On-line Basic Course Starts at 19:00 hrs**	19 **1930 SEPAR Net** **2000 SARC Net** **Classroom Basic Course Starts at 18:30 hrs**	20	21	22	23 7:30-9:30 AM SARC Social: Kalmar Family Restaurant
24/31	25	26 **1930 SEPAR Net** **2000 SARC Net**	27 **1900 SARC Exec Meeting**	28	29	30 7:30-9:30 AM SARC Social: Kalmar Family Restaurant

Contest Details: http://hornucopia.com/contestcal/contestcal.html

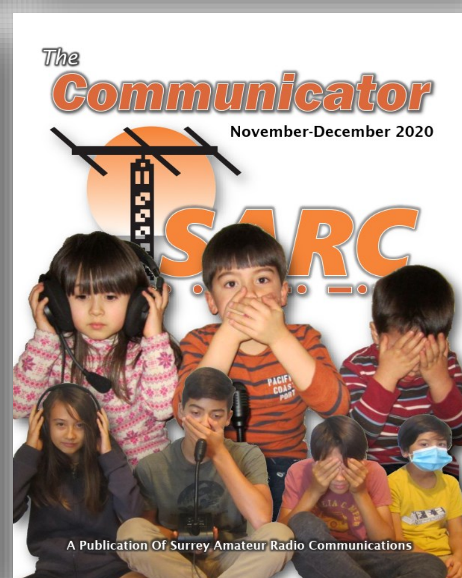
February 2021

Sun	Mon	Tue	Wed	Thu	Fri	Sat
For details on all SARC events, go to ve7sar.net	1	2 1930 SEPAR Net 2000 SARC Net	3	4	5	6 7:30-9:30 AM SARC Social: Kalmar Family Restaurant 8076 King George Blvd, Surrey, BC CONTEST: BC QP (all modes), MN, VT QP (all modes)
7 CONTEST: BC QP (all modes), MN, VT QP (all modes)	8	9 1930 SEPAR Net 2000 SARC Net	10 1900 SARC General Meeting [TBA]	11	12	13 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: CQ WW WPX RTTY
14 CONTEST: CQ WW WPX RTTY	15	16 1930 SEPAR Net 2000 SARC Net	17	18	19	20 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: ARRL DX CW
21 CONTEST: ARRL DX CW	22	23 1930 SEPAR Net 2000 SARC Net	24 1900 SARC Exec Meeting	25	26	27 7:30-9:30 AM SARC Social: Kalmar Family Restaurant CONTEST: NA QP RTTY
28 CONTEST: NA QP RTTY						

Contest Details: http://hornucopia.com/contestcal/contestcal.html

SURREY AMATEUR RADIO COMMUNICATIONS

It was a very good year for The Communicator



On behalf of our Editors,

Thanks for your contributions,
and thanks for your support!

Recent stats include 125 countries

Ham Gear For Sale

For sale are **Four 8' long tower sections** = 32' free standing. The bottom anchors are missing as they were left in the concrete, after it was taken down. **$75.00 or best offer.**

Kjeld also has a rather large Marine Radio (HF?) sitting at his home and he'd like to find a new home for it. If you're interested contact him.

Contact: Kjeld VE7GP 604 531 6396 or VE7GP@telus.net

70 cm Fast Scan TV Transmitter

For sale is an analog fast scan (NTSC standard) ATV transmitter in a hardened and waterproof metal case. Suitable for mounting outdoors. Last used by hams at Simon Fraser University on an emergency communications project in the early 1990s. Runs on 12 VDC. Approximately 100 feet of power/antenna/control cables included. As is, but if it doesn't work to your satisfaction you can return it. **$100 OBO.**

Contact: Kevin McQuiggin VE7ZD/KN7Q mcquiggi@sfu.ca

IC 910H VHF/UHF all mode transceiver $1500 (firm)

Fully loaded for 2m, 440 MHz, 1.2 GHz
Includes:
HM-36 hand mic and manual
UX910 (for 1.2 GHz operation)
FL132 (main band narrow CW filter)
FL133 (sub-band narrow CW filter)
CR293 (high stability crystal)
UT106 (DSP noise reduction/auto notch)
I can also provide at additional cost:
2m/440 MHz/1.2 GHz triplexer so you can use this radio on a single multi-band antenna and CT-17 CI-V level converter for interfacing this and other radios to your computer.

WANTED: **OLD NATIONAL GEOGRAPHICS AND READERS' DIGEST MAGAZINES.**

Contact: John VA7XB va7xb@rac.ca or 604-591-1825

iPhone 6S

Near new, in the box. This is the larger model, and still under Apple warranty. Perfect and unblemished. Gold colour.

Contact: John VE7TI ve7ti@rac.ca

Radio-Active

Profiles Of SARC Members

John Brodie VA7XB

Gary Peare VE7GPR

Born in Enderby, Leicestershire, England in the late 50s, I was the 3rd child in our large family of 7 children. Soon after my birth, we moved to the Midland city of Derby. My father was an engineer at Rolls Royce designing and building jet engines. My two older brothers both became pilots and my two younger brothers became machinists. One sister is a professional horse trainer in Langley B.C, and the second is an RN in Australia.

My ancestors were clock makers and engineers in England. My grandfather built motor cars at the turn of the century and is credited with starting the auto industry in Ireland which began as a garage, one vehicle at a time before mass production was developed. If you google W.F. Peare you will find some history about the auto world of 1900:

www.carrickonsuir.info/carrick-people/people-of-note-2/140-w-f-peare and https://www.gracesguide.co.uk/1953_Who's_Who_in_the_Motor_Industry.

In 1966, when I was at the age of 9, the family relocated to Montreal as my father was transferred to manage the engineering department of Rolls Royce Canada. I was excited about coming to the "wild west" as it seemed to me. My first school in Canada was Herbert Purcell in Pierrefonds, Quebec.

It was around this time that I built my first crystal radio. As an inquisitive kid I spent lots of time in the .621 (Applied Physics) section of the library. My parents, recognizing, my interest in technical things, bought me one of those '101' electronics experimenter kits for building all manner of things. In later years I purchased the same for my daughters. Before I was 12, a friend and I built a tube amplifier using 6SN7 and 6V6 tubes. Technical difficulties were overcome with the help of a friendly neighbour, a CBC technician.

In my early teens I embarked on my first foray into the world of ham radio, which included the compulsory Morse code. However, with other teenage distractions this was never

completed. I was lucky to have several mentors in my life including VE2AKZ who tossed old electronics items at me to tinker with. As well in High School we had plenty of vocational training, such as machine shop, auto shop, drafting and, of course, electronics. It was in the electronics shop that I spent lots of time after school. I have fond memories of building Heathkits and transistor projects. My favourite transistors at the time were the 2N107 and CK722, which were readily available. I still have many of these devices in my shack and always hoped some kid would drop by much like I did when I was a child, so I can move some of this stuff out and hopefully spark an interest.

After finishing high school and completing college courses in digital electronics, math and auto mechanics I was hired by an electronics firm in Montreal, building video control systems and operating wave solder machines. One wonders what were the toxic effects on me of the chlorinated hydrocarbons used in the vapour degreasing. My abilities were recognized so I was promoted and gained employment in refurbishing line printers, RJE computer terminals and high capacity disk drives. After completing more advanced electronics courses on microprocessors, I was then hired by Raytheon Data Systems maintaining passenger reservation systems, which required a move to Vancouver. I am now with a company called AMS, working on mini computers, including Honeywell Level 6 machines, and have been with them for 39 years.

At this time in the 1980's I became active with my other 'love' (besides my wife) and earned a private pilot's license. I have flown many light aircraft over the years and involved with a few flying clubs, including the Boundary Bay Flying Club out of Delta Heritage Airpark, as well as the Langley Aero Club, serving many positions on their Executives.

Avionics has always been a big interest for me, and occupies much of my spare time. I am currently installing a full avionic suite in a Vans RV4, a 2-place sport plane, involving a Garmin EFIS commonly known as a 'glass cockpit' which in effect replaces all the old style 'steam gauges' and finally VHF radios. I have flown and/or owned several aircraft including a 1946 Cessna 120, a Mooney and more recently a Piper Cherokee.

Figure 1: Crystal set built by Gary's daughters

Figure 2: Copy of an Ampeg 15 build by Gary and his daughter

Both my daughters were exposed at an early age to flying and the world of technology. My older daughter found her passion in the 'anime' world and the younger daughter is a 'mechatronics' engineer, designing control systems for the lumber industry. Even in elementary school,

Figure 3: Gary and daughter with Piper Cherokee

SURREY AMATEUR RADIO COMMUNICATIONS

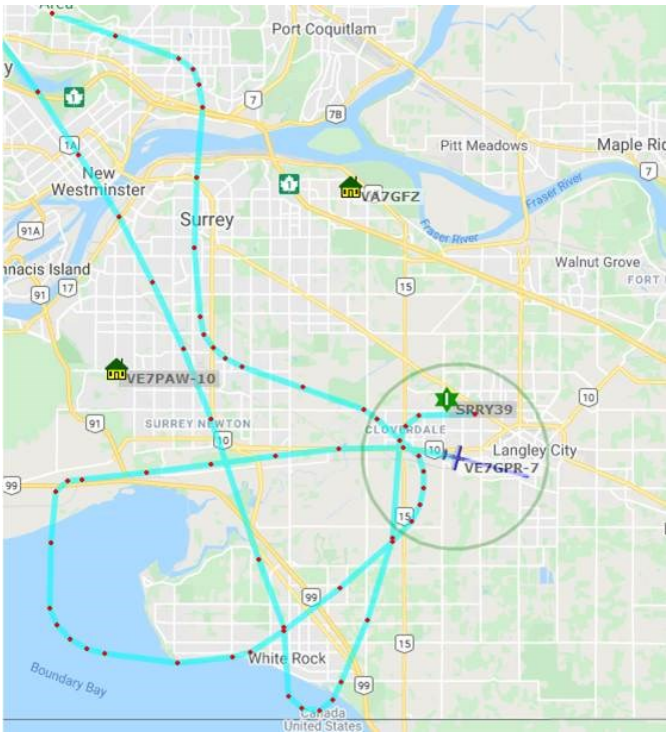


Figure 5: Gary's November 11th (Remembrance Day) flight track

she had a gift for technology and built a Reflex vacuum tube radio, a PIC controlled robot for the Science Fair and was licensed as a pilot at the age of 17. My wife, Lesley, and I are proud of their accomplishments.

My interest with SARC is to promote the organization similar to what I have done in avionics. For example, I have flown 'EAA Young Eagles' which later became 'COPA for Kids', an introduction for Canadian youth into the world of general aviation. I am proud to say that a few of these kids grew up to become pilots, all because they took that first flight. I would always warn the parents jokingly that this may get expensive for them.

Editor's Note: Gary finally pushed aside his other many distractions and in 2019 took the basic course and passed with honours then becoming VE7GPR, followed by the Advanced certification. Well done, Gary, and welcome to SARC.

~ *John VA7XB*

Social Reminder

The Surrey weekly social gathering is on Saturday at the Kalmar Restaurant at 80th and King George Boulevard between 7:30 and 9:30 am. You don't have to be a SARC member to participate. The restaurant practices responsible social distancing.

The SARC Contest Contender

The Importance of Contests

John Brodie VA7XB

Why it is important to use your radio occasionally so you don't have surprises when you need it in a hurry…

With the combination of COVID and our loss of the OTC, it has been a lean year for contest activity. In fact, the RAC Winter Contest was to be the first one for me since the BC QSO Party in February. Consequently, the radio has sat unused for much of the year.

So first thing to do was dust off the equipment, scrape away the cobwebs and see if it all works. I had kept screen shots of all my Microham and N1MM+ settings so spent some time reviewing those. Then I checked all the tuner settings on the amplifier, to confirm the tuning hadn't changed. It had in fact changed, but that was easily fixed. Though I planned to operate CW, I then made some .wav files to use with voice macros simply to refresh my memory on how it is done, before asking Steve VE7SXM, our one SSB operator to do the same.

Jan at the station controls of VE7SAR

With everything now installed, checked, tuned and ready to roll, I fire up the radio on a dummy load and give it a workout on both CW and voice macros using the function buttons.

But… rats, something is seriously wrong because when the transmitter is keyed, it stays keyed and will not shut down no matter what I do. I review all my settings but to no avail. After much head scratching, I check the settings on the radio, only to find that the CI-V is ON when it should be OFF. OK, so that is fixed it (or so I think) and all is set to go after a few more trial runs.

Friday evening at 5 pm, the contest starts and I am running 1000 watts on CW. First contact, yikes the computer freezes up and the only way I can complete the contact is manually with the paddle and keyer. What's this all about? I reboot the PC, Microham and N1MM+ and try again. Second contact, same result. This seems like it might be an RFI issue, so I clamp ferrite cores on all the leads to the PC, turn off the amp, reboot and try again. Success this time! I make a few more Qs without problem, then I turn on the amp and give it a little power. So I start at 150 watts and, experiencing no problems, raise it to 300 w. Over time I gradually increased it further until by the end the contest 24 hours later we are running 500 watts and making all the contacts we can handle. Not bad for 3 operators sharing one transmitter operating at much less than full power.

SURREY AMATEUR RADIO COMMUNICATIONS

Friday night was very slow on 80, 40 and 20 m and made a few Qs on search & pounce, but I didn't persevere after about 9 pm. Got up early in the morning, found 40m open at 6 am so made a few Qs before Steve VE7SXM arrived at 8 am. Over the next few hours conditions gradually improved and on SSB he was taking on pileups bigger than he might have wished. But he was able to handle it and at 11am, turned the station over to Jan VA7VJ, who ran continuously for the next few hours on CW with a never-ending intensity of pileups. When Jan left at around 2 pm, the pace had not let up and I was able to pick it up and continue to 4 pm, which took us to a combined total of 604 contacts for the 24 hour contest period. Now, it is time to figure out what is the source of the RFI and what can be done about it before the BC QSO Party in February.

Well done, All.

~ *John VA7XB*

Band	CW	USB	Total	Accum
3.5	72	0	72	72
7	108	0	108	180
14	349	75	424	604
Total	529	75	604	604

Here are the stats and Steve VE7SXM at the station

Minimalist QRP Book V5.3 from IZ3AYQ

It's a free download:

There should be enough ideas contained in it's 77 pages, for you all to get building something in the new year.

https://drive.google.com/file/d/1dw61-PQ-4JA9feh93H_KrldD4RpN1zZT/view

The Contest Contender II

2020 RAC Winter contest

Fred Orsetti VE7IO

Another success using distributed mult-op (DMO)

...using a DMO setup was a great way to stay together as an operating team

First I would like to thank the contest managers at Radio Amateurs of Canada for adding a DMO category to the rules. At this time following the stay at home rule meant that our usual operators for this contest could not operate from one multi-op station. So using a DMO setup was a great way to stay together as an operating team. Even though our score is not eligible for awards we think the fun factor and putting VE7RAC on multiple bands and modes was very rewarding.

So, the five operators once again setup to operate from their own stations. The only variance from this was at my, VE7IO's, shack where we had one operator in the shack and one operating remote using the second radio in the shack. We used Hamachi VPN software which allows for 5 clients free. The setup was Jim, VE7FO, in Vancouver, Al, VE7WJ, in North Vancouver, John, VE7TI, in Surrey, Stan, VA7NF, at VE7IO shack in Surrey and me, VE7IO, operating the second radio in my shack remotely. When setting up Hamachi each computer on the network is one client seat. So if there are two computers in the same shack each one needs to be invited onto the network and occupies a seat this covered the remote computer.

We have used this setup for four contests now and each one has been a success. A nice feature of N1MM using this setup is that you can use the built in message feature to stay in touch with other stations on the network. Requests for an operating schedule change, as an example, are easily completed using the message feature.

On the N1MM network status window each station's operating frequency, and other information, is displayed. In order to know when an operator had gone QRT we asked that they leave their radio on an unused frequency so that everyone would know they were taking a break and their previous operating band was available.

When a station completes a Q and hits enter it immediately shows on all the computers. The radio used for this RAC Winter contest varied and included a K3, an Icom 7700, an Icom

7300 and two Icom 7610's. Antennas used were a 3 element tri-banders, a 3 element SteppIR, a log periodic and wire antennas for 40, 80 and 160.

Setting up for previous contests using Hamachi VPN have go very smoothly and likely lured us into a sense of complacency when it came to testing the network ahead of the contest. So, for this contest we focused on making sure the VPN was working on all computers and it was. However, we failed to test all computers on the N1MM network mostly because previously this has not been an issue. Well, Murphy showed up at the start of the contest and one computer would not network on N1MM. We tried all the usual fixes but no joy. The affected station continued to log Q's while additional solutions were tried. Eventually we managed to find a solution and the only thing we can think of is that somewhere there was a mismatch in the N1MM setup. It was a learning experience for us in that we will always test N1MM network pre contest and we will confirm that each stations has the same configuration.

The confusion we experienced at the start of the contest caused us to end up with 3 additional databases each with a number of Q's that had to be synced into the master log at the end of the contest. I immediately contacted one of the N1MM programmers for guidance on merging these logs as I had visions of screwing up the master data base. The advice was to make a backup of the master log and then get the problem computer networked with the master computer. Once we had this confirmed we did a resync and rescore of the 3 logs with the master. The happy ending is that this procedure worked and we ended up with an accurate master log.

We did end up with more Q's on CW than phone and this is something we will look into for future contests that are CW and SSB. Could it have been that there were more CW stations available? Could it have been noise which I have plenty of that impeded the SSB signals?

In summary it was a very good contest and using the DMO setup provided a great opportunity to operate as a team using VE7RAC.

~ Fred VE7IO

Summary: Compare Scores

Band	CW Qs	Ph Qs	CW Mults	Ph Mults	
160:	54	0	5	0	
80:	131	34	8	5	
40:	252	5	8	2	
20:	474	248	11	10	
15:	265	162	8	5	
10:	0	0	0	0	
6:	0	2	0	1	
2:	0	9	0	1	Total Score
Total:	**1176**	**460**	**40**	**24**	**471,552**

SURREY AMATEUR RADIO COMMUNICATIONS

General Meeting Minutes

November 11, 2020

Attendees: 24

Meeting Start: 7:03pm

Location: Online Zoom Meeting

Welcome & presentation of agenda (John VA7XB)

John Brodie: This is our second online Zoom meeting and the Oct meeting went very well. Thank you to Jeremy Morse for the assistance. It looks like we will be hosting online meetings for the foreseeable future and one advantage is that those members that are from out of town can now attend the meetings.

John Brodie: Call for additional items to the agenda. Jinty moved to accept the agenda as presented. Seconded by Gord Kirk. Carried

John Brodie: Does anyone have amendments to the minutes presented in the last communicator? None heard.

One minute of silence was observed for Remembrance Day 2020

Self-Introductions

New members and visitors:

- John MacFarlane VA7PX
- Richard Songhurst VE7IMH
- John Meneghello taking the online course right now
- James Harris VE7GDZ just passed test last night
- Frank Kowalishyn VE7KKV
- John van der Est VE7QU

Announcements (all)

Jinty Reid passed on a request from Chris Zetner. His Honda Accord broke down so he parked the car at the shoulder on the side of the road of the Alex Fraser Bridge. Somebody stole his catalytic converter. That was between the hours of 7:45am and 1:30pm on Nov 9th. If anyone witnessed it or has further information on this he would appreciate you calling the Delta Police File # DE20-25426

John Brodie: Our longtime member Heinz Buhrig VA7AQ is having some health issues and is unable to continue as QSL manager. We all wish Heinz a speedy recovery and a return to good health. We will be looking for a new QSL manager and should note that it should be a regular HF contestant and QSL procedures. (Logbook of the world)

John Brodie: The Fox Hunt date has been set for May 8th/2021 please mark your calendar.

Gord Kirk: Nov 26th SEPAR will have its regular meeting on the 4th Thursday of the month. Please email Gord Kirk va7gk@shaw.ca if you're interested in attending.

Financial Report (Scott VA7HA)

John Brodie: We have submitted our application for annual RAC insurance. We are waiting for an invoice from RAC. We've been warned to expect an increase of 10,15,20% over last year's fee. It's approaching $1000 per year for this insurance policy. This provides liability coverage for events we are involved in as a club as well as liability insurance to individuals that are members of RAC. We also have loss insurance for some of our more expensive equipment items.

Committee/Liaison Reports

SEPAR (Gord VA7GK)

Gord Kirk: SEPAR has an upcoming monthly zoom meeting every 4th Thursday. Please email Gord at va7gk@shaw.ca if you're interested in attending.

We have a NEW radio that is uses IMERS (Inter Municipal Emergency Radio System) and provides communication between multiple EOCs (Emergency Operations Centres)

Ham Class (John VE7TI)

John Schouten: We had the first set of exams last night. About 50% is classroom and 50% is online only. 6 people took the exam 1 week early and 5 passed. 4 received honors and 1 was very close to honors and will re-write to improve his score.

John Schouten: Industry Canada callsign registration is now incredibly quick upon a successful test result. It only takes a few minutes to create an account and choose a callsign.

John Schouten: Next class will be online or both Jan 18 online and Jan 19th in class

John Brodie: We have 15 signed up for the Jan class about 50/50 online/in-class.

Repeater Update (Steve VE7SXM)

Steve McLean: There has been some noise and issues on the repeater known as intermod interference and may also be impacting other local repeaters. Sat AM John, Gork and Steve visited the repeater site to clean the ground connections and troubleshoot further. The south repeater is still off at this time while we troubleshoot the problems.

Steve McLean: Another discussion item is the potential to replace the current IRLP nodes and will be raised with the directors. If the directors pursue this option the recommendation will require membership approval for that expense.

John Brodie: We continue to work with Dave Cameron to resolve this issue and he's the most capable person to help solve this. He set up the repeater for us years ago and is also the IRLP guy.

Membership (John VA7XB)

John Brodie: Our membership continues to grow and we are currently at 160 of which 50 are ham class members. 110 is still quite high and continues to increase. Thanks to John S, Stan and Kevin for the help on the ham class.

Communicator (John VE7TI)

John Schouten: The latest issue came out on Nov 1. Some of the tracking has shown we are now reaching 120 countries. SouthGate Amateur Radio news is a big distributor of amateur news but they have not published ours this month. An email has been sent to the editor to determine the issue.

SURREY AMATEUR RADIO COMMUNICATIONS

John Schouten: VNA (Vector Network Analyzer) article that we published from a ham in Holland has now given us the go ahead to publish the rest of his series.

John Schouten: Next issue will be the Jan/Feb issue so late December the final articles will be collected. Please send articles, images, stories to communicator@ve7sar.net

Operations & Training Centre (Gord VA7GK)

Gord Kirk: Work is going on with the City of Surrey to secure a NEW location. There is a building being proposed near our storage container. It is still a shared space for SAR and NEPP.

We have had a discussion with the City of Surrey about the raising of a more permanent tower near the building. This could cost $1700 to apply for permit $1500 or more for an arborist to remove some trees/brush, and other unknown planning costs reach nearly $5000. There is a possibility that the buildings could still be moved in the future so we are now looking at how we can utilize the portable tower at least until we know where we will be longer term.

Contests (John VA7XB)

John Brodie: The big contest coming up is the RAC Winter contest Dec 19th. Unless another volunteer comes forward John would agree to host the contest at his home station.

Stan Williams: Fred Orsetti may be running a distributed Op as the BC VE7RAC station. The distributed multi-op is becoming more popular and accepted by contests.

Steve McLean: Interested in participating.

New Business

Nothing heard

Presentation videos

Downloading repeater frequencies from BCARCC website to Chirp https://youtu.be/Uhrw4x4PYJc

Space Weather Part 1: https://nsarc.ca/nsarc-john-white-space-weather-pt-1/

Next meeting December 9

John Brodie: In lieu of the Christmas party we may have a December Zoom meeting. Option to continue the Space Weather Part 2 or take a break? This will be raised as a topic for the directors and an announcement will follow in the next few weeks.

Adjournment (John VA7XB)

Steve McLean: Moved to adjourn the business meeting ahead of the Space Weather Part 1 video presentation. Frank Kowalishyn seconded. Carried

Meeting Adjourned at: 8:01pm

~ Jeremy Morse VE7TMY

General Meeting Minutes

December 9, 2020

Attendees: 30

Meeting Start: 7:02pm

Location: Online Zoom Meeting

Welcome & presentation of agenda

John Brodie VA7XB welcomed the group to the Zoom meeting and presented the agenda.

Self-Introductions

Al Neufeld VE7AN/VE7CDC joined us from Sorrento (outside of Kamloops). He has been active with the Salmon Arm and Kamloops Radio clubs.

John MacFarlane VA7PX/VE7AXU joined us from Qualicum beach (central Vancouver Island). He has been on the island for 5 years but was previously active with SARC for 10 years.

Frank Eichel VE7AWV has been a member of SARC for many years but was working/living in Victoria and a member of West Coast Amateur Radio Association, unable to attend until he retired.

Fred Reichstein VE7MPI in Surrey hasn't been able to attend for a while. He now has Zoom setup and able to attend on his laptop.

John van der Est VE7QU has been a licensed amateur since 1969. He worked at the SFU Science/Technical Centre for over 30 years and spent his spare time away from electronics. Now that he has retired, he's become more active in amateur radio.

Johnny Jiang VA7JJY has been working from home for half a year due to the pandemic. He recently moved from North to South Langley and now he is enjoying setting up antennas and radio equipment.

Maik Hassel VE7MHK is a recent graduate from the SARC basic course and looking forward to getting involved with the club.

Thomas Aboott ZS1TE is a South African licensed radio operator and is not yet licensed in Canada. He is looking forward to getting involved in the club.

Bill Mayer has recently completed the SARC basic course and is preparing to take the exam soon. He is looking forward to participating with the club and learning about amateur radio.

Reg Natarajan VA7ZEB is currently in Columbia and has finally booked a return flight to Vancouver and is planning to arrive just before Christmas.

Scott Thomas VE7KAT is in his second year with the club, and completed the CW course last year and is trying to keep up his skills.

SURREY AMATEUR RADIO COMMUNICATIONS

Ralph VA7UB and Nell VA7PE said hello to everyone

Robert Fishwick VA7FMR is staying isolated as much as he can but keeping himself busy and staying safe at home.

Treasurer's Report

Scott VE7HA presented the Treasurer's report. Expenses included payment for the BCQP plaque and RAC insurance. Income included ham class fees, membership dues and name tags. Members who wish a detailed accounting should contact Scott. Scott is looking into the feasibility of e-transfers to avoid PayPal service charges.

John VA7XB reported that SARC was awarded a community grant of $500 from the City of Surrey for Field Day. We did not have a field day this year due to the pandemic but still have fixed operating expenses. These expenses will be submitted for payment.

SEPAR report

Gord Kirk VA7GK reported that SEPAR meetings have been conducted via Zoom. Jim Hurrell VE7HUR has written up the steps to get active with SEPAR. Normally a SEPAR appreciation dinner is hosted but this is not possible at this time. Instead, the City of Surrey including the Mayor have sent out a thankyou video as a way of showing appreciation to the members of SEPAR for their contribution this year. The video is a private link for SEPAR members; please email va7gk@shaw.ca if you didn't receive the link. If you are a recipient for a years-of-service pin Gord will get it to you. Ed Sebulsky VE7AFC Is being honoured for 50 years of volunteer service with SEPAR. Fred Orsetti VE7IO is also being recognized for 25 years of service.

Repeater Issues

John VA7XB: The noise and intermodulation issues with our repeater are not totally solved yet. This is a result of mixing our repeater output signal with a local AM station at 600 KHz which happens to be the same as our repeater offset frequency. The more specific cause is thought to be non-linear junction effects of equipment corrosion from boiler off-gases entering the room a few years ago. Dave Cameron VE7LTD has been trouble-shooting with assistance from Steve, John, Gord in recent weeks.

Steve VE7SXM: While troubleshooting the intermod issue, ground connections were cleaned and an alternative antenna was connected, to no effect. It was also found that 2 of the 4 stages of the 80 amp power supply are not working and the unit is badly corroded. The battery backup is also in need of replacing. Dave Cameron is going to bring up another duplexer. We still may need to take down and inspect the antenna. The IRLP nodes in the North site are obsolete and slightly affected by the corrosion.

Steve moved that we replace the power supply at a cost of $895 and purchase new batteries for the north and south sites ($300 x 2) plus tax. Seconded by Stan VA7NF. The motion passed.

Steve moved that we replace both the VHF and UHF IRLP nodes at the north site at an estimated cost of $1000 plus tax. Seconded by David VA7DRS. The motion passed.

Steve expressed big thanks to Dave Cameron for all his expertise troubleshooting this issue and working on improving our repeater site.

OTC Status

Gord Kirk VA7GK reported on a recent meeting with the deputy fire chief and also the electrician responsible for the space. Some measurements were taken and our power plan was reviewed. They are looking to see if they can move a few circuits around for us. We also discussed the placement of the smaller portable tower (previously known as "old yeller" now "old grey").

Stan VA7NF suggested that some thought should be given to the grounding environment, including an RF ground and asked if this was raised with the City of Surrey. Gord VA7GK replied that they are aware we need grounding but they may be thinking electrical ground at this time.

New Business

John VA7XB suggested we should continue with weekly nets on Dec 15, 22, 29 over the Christmas period. No objections heard.

Stan VA7NF advised that the RAC Winter contest is coming up on Dec 18th and Fred VE7IO is running the sponsor station VE7RAC.

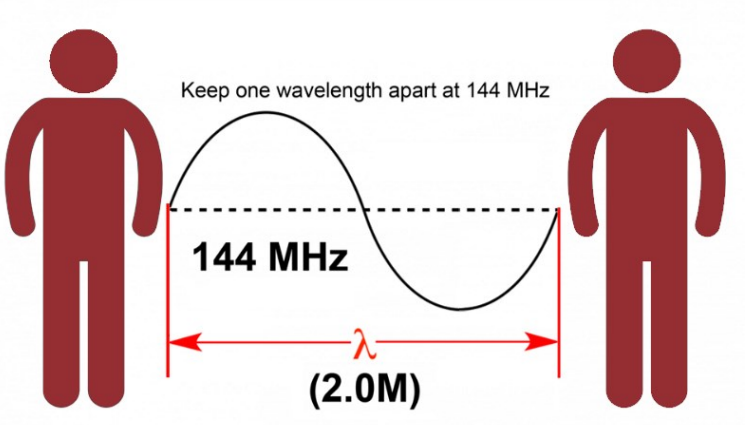
Presentations (John VE7TI)

1. **Working the ISS Repeater** will provide an update on the Amateur Radio capabilities of the International Space Station. The ISS is now easier to work than ever, even with a stock handheld transceiver. The recently installed repeater is very like a terrestrial repeater except that it is very high, with no obstructions to interfere with the signal. Contacts over thousands of kilometers are possible with minimal skills. We'll also look at the other ISS Ham equipment *[see article page 62]*.
   - Video: https://youtu.be/Nl_qtSqqDhw
   - Slides: https://drive.google.com/file/d/1haHWruHdiXkfyfaxGAVV57R05VxmND3L/view?usp=sharing
2. **HamShack Hotline** is a relatively new free service that adds yet another emergency communications resource to your communications toolbox. Using readily available and low-cost used PBX phones, Hams can sign-up to become part of this private network. It allows full-duplex calls within the Amateur Radio subscriber network worldwide, specialty and public bridges and linkages to DMR and other digital systems *[see article page 70]*.
   - Slides: https://drive.google.com/file/d/1sM0alJyKC7TLiRR7wbBjfU_KSKlSqUIi/view?usp=sharing

Motion to adjourn the meeting by Steve M. Seconded by John S. Carried

Meeting Adjourned at: 9:09pm

~ *Jeremy Morse VE7TMY*



SEPAR Report

A year like no other!

Gord Kirk VA7GK
SEPAR Coordinator

It has been a year like no other in recent history. We have been challenged to maintain our Emergency Program while staying physically apart and limiting our meetings. Like every challenge that we are presented with, we have found ways to keep moving along.

Amateur radio is the original social distancing network and we are used to communicating while more than 2m apart. Over the years individuals have experimented on ways to go beyond simple voice transmissions and transmit pictures and text (email) without traditional infrastructure. Almost all of us are now familiar with Zoom and are comfortable participating in meetings using it. SEPAR has transitioned just about all of our meetings into the virtual environment using either our radios or Zoom.

One of the reasons for the existence of our emergency program group is "to provide communications when traditional methods of communicating have failed or are overwhelmed". While the local emergency services (Fire, Police an Ambulance) have robust communications and utilize these each and every day the average citizen often takes for granted the communications they rely on.

Just about everyone now has a cellular phone which probably gets used more for the programs and apps than the voice phone call. Information is at our fingertips everyday and communicating with our family and friends through social media is an important part of our daily routines. It is when something impacts this that we try and find other sources for information. TV and the AM/FM radio is also a go to for

> *It has been a year like no other in recent history.*

SURREY EMERGENCY PROGRAM AMATEUR RADIO

This year it is my hope that each licensed Amateur Radio Operator will take the time to be a little more prepared.

information. However when the disaster is nearby and possibly going to directly impact (or already has) that other methods of communication become extremely important. Providing relevant factual information when the more traditional methods of obtaining this are not available will be appreciated by your neighbours.

Recognizing this SEPAR started last year and will continue to grow our ability to tie into our communities. We have participated with NEPP (Neighbourhood Emergency Preparedness Program) on developing a communications strategy to tie the local neighbourhoods into the city via amateur radio. This will allow the local neighbourhoods to get messages to and from a local Ham radio operator within their community.

As well the SEPAR members have been working on each individually having a Winlink Station to provide radio access to the internet for short email messages. In fact as of Dec 30 we have had more that 500 checkins over the last year via Winlink to the weekly Winlink checkin. Each Tuesday a message is sent out to anyone interested with a simple question to reply to as your checkin. The questions have been relevant to the weather or other things happening within the area, helping participants think through areas they may have not previously thought about as part of their preparedness. Those without the ability to participate via radio can still participate via Telnet using the program so they remain familiar with its use as well as keep their Winlink account active.

With the limitations due to COVID we continue to work on areas of our SEPAR program which do not require in person meetings. We have begun to review our Standard Operating Procedures and reviewing our documentation. These are tasks which can be done by individuals at home and are important ensuring we are training and operating in a common fashion. Rebuilding our documentation and plans will allow us to teach new members how we need to work in support of the city. While reviewing these plans we can test out our gear and make sure we remember how to use it when needed.

This year it is my hope that each licensed Amateur Radio Operator will take the time to be a little more prepared. Prepared as a family for an emergency or disaster in their lives as well as prepared to assist with their radio and training in the community. Simply learning how your local amateur radio community plans on helping during emergency situation and participating in the local emergency net is a good start. Take some time and reach out to see how you might be able to help out.

I hope everyone has had time to enjoy with their families over the Christmas Holiday Season and enjoys and very Happy New Year.

~ *Gord VE7GK*

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SURREY EMERGENCY PROGRAM AMATEUR RADIO

What communications procedures you may want to arrange for family emergency preparedness.

- Part One: Emergency preparedness: https://goo.gl/EKvnvZ
- Part Two: (2) Emergency Communications Part 2 After The Disaster - YouTube
- Part Three: (2) Portable Amateur HF Emergency Communications | EmComm Part 3 - YouTube

And some other videos you may be interested in:

- How to program repeaters into your radio https://goo.gl/opr3P7
- How to use APRS https://goo.gl/brWMTH
- Go Digital: https://goo.gl/H6yg2B
- What radio should I buy? https://goo.gl/LupLWz
- Get an SDR? https://goo.gl/2tWPBS
- Setup FT8 https://goo.gl/RMBRrW
- Setup JS8Call https://goo.gl/E3hJmg
- Setup PSK31 https://goo.gl/PULVQG
- Using PSKReporter www.PSKReporter.info
- Satellites for ham radio: https://goo.gl/mtW9ab
- What Mobile radio should I get? https://goo.gl/cPznGU

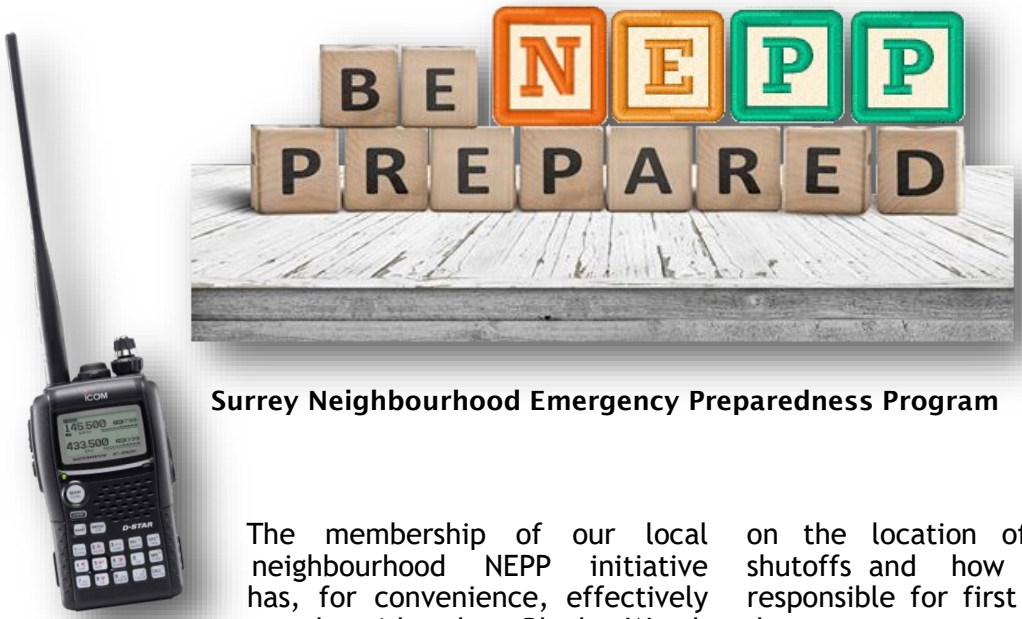
separ
Surrey Emergency Program Amateur Radio

Name	Frequency	Offset	CTCSS
VE7RSC (Primary Repeater)	147.360	+0.600	110.9
VE7RSC (Secondary Repeater)	443.775	+5.0	110.9
VE7RPT (Primary Regional Repeater)	146.940	-0.600	Optional 136.5 Rcve
Simplex 1	(VHF) 146.550		
Simplex 2	(VHF) 147.420		
Simplex 3	(UHF) 446.550		
Simplex 4	(UHF) 447.425		

Other frequencies in the Greater Vancouver area:

Primary: Coquitlam/Abbotsford	146.430	
Primary: Inter-Municipal Group 3	146.445	
Primary: Vancouver; Mission; Sec. Coquitlam	146.460	
Primary: Kent-Mission; Sec. Richmond	146.475	
Primary: Inter-Municipal Group 2	146.490	
Primary: New West; Sec. Richmond	146.505	
National Calling / FM Simplex Group I	146.520	
Primary: North Shore; Port Coquitlam	146.535	
Primary: Bowen Island; Surrey	146.550	
Intermunicipal Group 1 Coordination	146.565	
Primary: Lions Bay/Vancouver/Delta/Langley	146.580	
Primary: Port Moody; Sec: Burnaby	146.595	
Secondary: Vancouver/Surrey	147.420	
Secondary: Vancouver (UBC) / Maple Ridge	147.450	
Primary: White Rock/Chilliwack; Sec. No. Shore	147.480	
Secondary: Burnaby/Pitt Meadows	147.510	
Primary: Delta; Sec: Abbottsford	147.540	
Primary: Hope; Sec: Delta; ALSO EMBC	147.570	

SURREY EMERGENCY PROGRAM AMATEUR RADIO



Surrey Neighbourhood Emergency Preparedness Program

John Brodie VA7XB

The membership of our local neighbourhood NEPP initiative has, for convenience, effectively merged with the Block Watch organization because the two groups share a common purpose, i.e. self-help and community awareness at a local level. It is no surprise that those who become involved in one group tend to be the same people who are willing to expand their interest into the other.

Unfortunately, active involvement of the full group of participants has dwindled over the last 6 months under the influence of COVID restrictions, but the smaller planning nucleus continues to meet periodically on Zoom to progress the plan by identifying needs and vulnerabilities and compiling critical information. Damn the torpedoes, full speed ahead – emergencies wait for no one!

We commit to sharing contact information only with each other. However, more sensitive data regarding special needs (medical, pets, children, age-related etc.) and member resources (equipment, generators, tools etc.) is collected and stored on a secure thumb drive retained by one of the team leaders and accessible by other team leaders on a "need to know" basis. So that the information is readily accessible during an emergency, it is also stored in printed form in a binder at a secure location known to the others. For this purpose, the group is compiling and sharing information on the location of power, gas and water shutoffs and how to turn them off. Those responsible for first aid, shelter & caregiving, damage assessment and search & rescue critically review their ability to undertake their responsibilities and embody this information into their specific plan. Adequate supply of water may be a huge issue; I have camping-type water jugs storing potable water, and rains barrels collecting roof runoff for use in non-potable applications; do you?

Being the team leader responsible for communications, I have recently replaced my old storage batteries for the radios, modernized my grab & go kit, learned how to send email messages by radio, and otherwise ensured that my role can be fulfilled if and when the time comes that it is needed.

Weekly SARC and SEPAR nets provide good practice in using the equipment and ensuring it is ready to go, supplemented by focused training of both groups. Basic certification courses are also becoming more popular and several members of our neighbourhood have become certified. Furthermore, I should note that hams are ideally suited to take on a leadership role in the development of local NEPP plans and I encourage you to step up and get something underway in your area.

~ John VA7XB

SWOT

John Brodie VA7XB

Many of you who come from the world of business will be familiar with the strategic planning activity known as SWOT, an acronym which represents an analysis of Strengths, Weaknesses, Opportunities and Threats. This being my year-end QRT, I thought it appropriate to use this tool to take a critical look at SARC and see what truths it reveals.

Ideally, SWOT should be carried out in a series of brain-storming sessions by senior employees or, in our case, by active members who may have latent ideas to help the organization move in new directions or reinforce the value of traditional activities and goals. Perhaps readers will find sufficient encouragement here to suggest additional SWOTS. We might even consider a Zoom meeting in the new year in which a moderator would take input from members to expand on the theme and confirm we are moving in the right direction or suggest an alternative direction.

My focus here is on the structural issues of SARC, as technical developments to amateur radio have been discussed at depth in recent editions of the Communicator.

Strengths

For an amateur radio organization, we have an unusually large membership, which might be accurately described as "critical mass" – this gives us access to a large pool of talent and resources.

This happy situation is not an accident – we have the Communicator, arguably the best amateur radio newsletter in the world, read by thousands over the globe. In addition, our basic ham certification class graduates something like 50-60 new amateurs a year, some of whom stay with SARC and SEPAR and participate in their growth. Even those who don't will typically purchase and use mobile or handheld radios and thereby swell the community of hams available to communicate by radio when needed in an emergency. A significant percentage have unique expertise and talents that can be put to good use in growing the organization.

Furthermore, we appear to have what can be described as a symbiotic relationship with the City of Surrey thus furthering the ability of the local amateur radio community to provide services in times of emergency. This relationship allows access to the first-rate Surrey Fire Training Centre classroom facilities for limited use by certification classes and – post COVID – for general meetings.

Weaknesses

While SARC's membership is large, the number of seasoned hams within our organization is small, consequently much of our growth is due to the efforts and talents of only a handful of energetic and talented members. This makes our success vulnerable to the continued health and willingness

SARC SOCIETY DIRECTORS 2020-2021

PRESIDENT
John Brodie VA7XB
president at ve7sar.net

VICE PRESIDENT
Steve McLean VE7SXM
vicepresident at ve7sar.net

SECRETARY / WEBMASTER
Jeremy Morse VE7TMY
secretary at ve7sar.net

TREASURER
Scott Hawrelak VE7HA
treasurer at ve7sar.net

DIRECTORS

Gord Kirk VE7GK
(SEPAR Liaison)

Kevin McQuiggin VE7ZD / KN7Q

John Schouten VE7TI
(SARC Publications/Blog/Social Media & Courses)
communicator at ve7sar.net
course at ve7sar.net

Stan Williams VA7NF

SARC MEMBERSHIP, NET & CONTEST MANAGER
John Brodie VA7XB
membership at ve7sar.net

SARC QSL MANAGER
Heinz Buhrig VA7AQ
15684 102 Avenue
Surrey, BC V4N 2G4

SARC REPEATER MANAGER
VACANT
repeater at ve7sar.net

of those few to continue with their significant expenditure of time, resources and talent.

In addition, we are currently without a radio-equipped facility (i.e. an Operations & Training Centre) and, as a result of COVID, denied the opportunity to meet together in person for technical and social activities. Both of these limitations are temporary and by this time next year, we hope to have overcome both. In the meantime, it can best be described as a holding pattern.

Opportunities

SARC is just one of several organizations which shares resources within the local amateur radio community, and are linked by a common objective. Each serve a different but complementary role: SARC provides certification, technical and manpower support to the others; SEPAR is comprised of RCMP security- checked volunteers directly providing specialized training and emergency communication services for the Surrey Emergency Program, and; NEPP is the umbrella organization of the City made up of neighbourhood groups organized at a local level for self-help during an emergency. SARC members are ideally situation to provide leadership in their own area of homes

for development of unique neighbourhood-specific plans. Along with the outdoors enthusiasts, 4x4 groups, and those simply wanting to prepare at a personal level, this is where the growth will occur. Whereas in the past there existed firm lines of demarcation between the various groups, new leadership within all 3 organizations and at the City of Surrey provides opportunities to work together in a mutually-supportive manner thereby strengthening each separately and collectively in pursuit of a common purpose.

Threats

The most significant (and obvious) threat to the health of our organization is that other methods of long-distance communication exist besides radio giving rise to the related perception that radio is not essential. A major earthquake with loss of power, Internet and telephone would quickly make the flaws in this view obvious. With all its negative aspects, COVID at least has drawn the public's attention to the realization that we are not immune from calamities that may affect our lives in major ways. Still, the IT world continues to draw away the attention of young people who are attracted to hobbies with a technical focus . Our aim must be to keep up with technical developments in amateur radio so that SARC can also offer exciting challenges for those who wish to push into new frontiers in the world of electronics and radio.

~ John VA7XB

It's January

Well, it looks like Winter, but Happy New Year and welcome to another year of great Amateur Radio activity with SARC. We are now up to 200 members and, with your input, we can tailor programs to fit all experience levels and all facets of our great hobby.

At our general meeting on Wednesday, January 13th we will feature a joint presentation on 'Getting On The Air—VHF/UHF', followed at the February 9th meeting with 'Getting On The Air—HF'. Whether you're a beginner or pro, we think you will enjoy these topics.

Please join us on Zoom, visitors always welcome.

Take care, stay healthy!

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

We are looking for a SARC Net Manager. Its not a difficult job and, if you have some time to spare, we'd like to hear from you. Basically it involves scheduling someone to do the Tuesday evening weekly net.

	SARC Net 20:00 Hrs
1st Tuesday Standby	Jean-Luc VA7JLU Vacant
2nd Tuesday Standby	Jinty VA7JMR Sheldon VA7XNL
3rd Tuesday Standby	Rob VE7CZV Vacant
4th Tuesday Standby	Kapila VE7KGK John VA7XB
5th Tuesday Standby	Jinty VA7JMR John VE7TI
Want a turn at Net Control? Contact the SARC Net Manager	

Down The Log…

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hrs at the Surrey Fire Service Training Centre, 14923 - 64 Avenue, Surrey, BC. Here is a what3words link and map: https://what3words.com/markers.addiction.ozone

Weekly SARC Social

Saturday between 0730 and 0930 hrs at the Kalmar Family Restaurant 8076 King George Blvd. Surrey

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+) Tone=110.9

SEPARS Net

Tuesday at 1930 hrs local on 147.360 MHz (+) Tone=110.9

VE7RSC Repeaters

2m North: 147.360MHz+ Tone=110.9Hz
IRLP node 1736
Echolink node 496228

2m South: 147.360MHz+ Tone=103.5Hz Fusion capable; No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6 Tone=110.9

70cm: 443.775MHz+ Tone= 110.9Hz
IRLP node 1737

We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for SARC.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee Klatch.

We thank our sponsors for their support of SARC

Please support them.